Appendices

DECEMBER 22, 2000

FINAL DESIGN (100%) SUBMITTAL

CENTRAL AND SOUTHERN FLORIDA PROJECT

ENGINEERING APPENDIX FOR THE TAMIAMI TRAIL MODIFICATIONS

GENERAL REEVALUATION REPORT/ SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (GRR/SEIS)

MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK

US Army Corps of Engineers
Jacksonville District

11148/00

CENTRAL AND SOUTHERN

FLORIDA PROJECT

ENGINEERING APPENDIX

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APPENDICES

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APP. A

APPENDIX A

PERTINENT

FLORIDA DEPARTMENT OF TRANSPORTATION

CORRESPONDENCE

Florida Department of Transportation

JEB BUSH
GOVERNOR

THOMAS F. BARRY, JR.
SECRETARY

March 30, 2000

District Six Environmental Management Office
1000 N.W. 111th Avenue, Room 6101
Miami, Florida 33172

Mr. Richard E. Bonner, P.E
Department of the Army
Jacksonville District Corps of Engineers
Programs and Project Management Division
Project Management Branch
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Bonner:

The Florida Department of Transportation (FDOT) is in receipt of your letter dated January 12, 2000 which recaps discussions held on November 3, 1999, between the FDOT and the Army Corps of Engineers (the Corps). As you know, on-going coordination between the Corps and the FDOT has been conducted in consideration of potential negative impacts to approximately ten miles of Tamiami Trail as surrounding surface water elevations are raised during the implementation of the Modified Water Deliveries to Everglades National Park (MWD) project. As noted in your January 12, 2000 letter, the Corps has reviewed a number of alternatives and has determined that construction of four bridges on Tamiami Trail would meet the Corps' future flow requirements and maintain a surface water elevation that would only affect the subgrade of the roadway during low frequency events.

During a meeting held on February 17, 2000, the FDOT presented their findings of review to the Corps regarding this proposed alternative. As stated in the FDOT's letter to the Corps dated May 7, 1999, the base clearance requirement may be reduced from 2 feet to one foot for purposes of conceptual alternative analysis. The clearance reduction is predicated on the use of black base (i.e., asphalt, which is more resistant to flooding than a limerock base [a limerock base would require a greater clearance of two to three feet]). The clearance would be measured from the design high water elevation to the bottom of the base at the outside edge of shoulder.

With existing roadway conditions, and assuming the desired flow of 4,000 cubic feet per second (cfs) with implementation of the MWD project, the Corps predicts a design high water elevation of 9.5 feet. An attachment to the FDOT letter dated May 6, 1999, provides the calculations which result in the proposed profile grade. It shows that the outside edge of the shoulder would need to be built to 12 feet NGVD in order to provide for high water elevations of 9.5 feet and at least 1 foot of clearance from the bottom of the subgrade (black base).

The Corps has proposed to build four bridges in strategic locations, without reconstructing the remainder of Tamiami Trail, in order to decrease future surface water intrusion into the base of the roadway. However, based on the Corps' hydrology study, the bridge option would only lower the surface water to 8.87 feet, lowered only 0.63 feet when compared to the option of having no bridges (existing). These numbers apply to the desired 4,000 cfs. If lower flows are considered, for instance 2,250 cfs, the study shows a difference of only 0.18 feet between the two options. This appears to indicate that constructing bridges will have a negligible positive effect in reducing the water levels. Assuming that the Corps reduces the flow from the desirable 4,000 cfs to 1,600 cfs (with or without bridges), the highway would still need to be elevated and reconstructed with black base and there would be a gain of 1.5 feet which translates into a required crown elevation of 11.04 feet (down from 12.54 feet at 4,000 cfs). (Please note that it has been previously stated, in FDOT's May 7, 1999 letter, that the crown of Tamiami Trail would need to be at 12 feet NGVD with reconstruction. This was an incorrect statement and other citations within the same letter reflect that the elevation of the outside edge of the shoulder would need to be 12 feet NGVD if the water surface elevation were to rise to 9.5 feet. This translates into crown of 12.54 feet.) Please see the attached typical section.

The FDOT realizes the additional expense and complications, particularly on environmental grounds, that roadway reconstruction would pose. This is enhanced by the need to bring the roadway design to current standards, resulting in a wider typical section, with total reconstruction. The FDOT would entertain entering into an administrative agreement with the Corps whereby the Corps would perform maintenance on Tamiami Trail during the MWD program and the Comprehensive Everglades Restoration Project (CERP) implementation and for some specified time thereafter, in lieu of requiring total reconstruction. This could be accomplished through a Joint Project Agreement (JPA) between the FDOT and the Corps, which stipulates the Corps' responsibility for any necessary maintenance along this section of Tamiami Trail attributable to the elevated water levels.

Such an agreement would also be desired by the FDOT as the Corps is currently proceeding with regulatory water releases in meeting the requirements stipulated in the Biological Opinion (BO) Reasonable and Prudent Alternative (RPA) for the Cape Sable seaside sparrow. As discussed in previous meetings, it would be prudent for the Corps to consider the monetary, environmental and safety costs of long term, continued maintenance on the Tamiami Trail versus total reconstruction.

Consideration of this issue has been coordinated with the FDOT Central Environmental Management Office in Tallahassee. The FDOT looks forward to continued coordination with the Corps in order to reach a mutually agreeable course of action in considering impacts to the integrity of Tamiami Trail as the Modified Water Deliveries program proceeds.

March 30, 2000
Richard Bonner
page three

Thank you for your consideration and continued communication in this regard. Should you have any questions in this matter, please feel free to contact me at (305) 470-5220.

Sincerely,

Marjorie K. Bixby
Acting Environmental Administrator
for

cc: Tom Barry
Jose Abreu
John Martinez
Gus Pego
Mike Ciscar

Chris Smith
EW 4/4

Florida Department of Transportation

JEB BUSH
GOVERNOR

THOMAS F. BARRY, JR.
SECRETARY

District Six Environmental Management Office
1000 N.W. 111 Avenue, Room 6101
Miami, Florida 33172

August 13, 1999

Richard E. Bonner, P.E.
Deputy District Engineer for Project Management
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Re: **Condition of Culverts under U.S. 41 / S.R. 90 / Tamiami Trail**

Dear Mr. Bonner:

Enclosed please find a report on the condition of the culverts under U.S. 41 / S.R. 90 / Tamiami Trail from Station 708 + 10.28 (M.P. 13.871, west of Krome Avenue) to Station 1299 + 46.28 in Miami-Dade County. As a follow-up to our February 15, 1999 correspondence to you, this field assessment and report were prepared by our consultant in response to your earlier request to assess the condition and need for maintenance of the existing culverts under Tamiami Trail in Miami-Dade County. The results of this assessment were previously relayed in my telephone discussion with Ms. Cheryl Ulrich, P.E., of your office on June 3, 1999. The enclosed report is forwarded for your files and provides additional details regarding the present condition of all culverts in this area.

In summary, there are 55 steel-reinforced concrete pipe culverts between the above referenced stations. These culverts are placed in groups (typically three) within a single head wall structure on either side of the roadway (please see report for photograph of typical culvert structure). A visual inspection of each culvert on both sides of the roadway revealed that all of the culverts were between 50% and 100% full of water . No culverts were observed with obstructions from substantial sediment, debris, or vegetation build-up inside of, or immediately adjacent to, the pipe openings. A southern flow of water was observed at each location with rates varying from slow to rapid. Based on the consultant's observations, it appears that at present, the primary determining factor for flow rate through the culverts is the water level. Rapid flow rates coincide with dredged waterways south of the culverts and restricted flow rates are associated with shallow water wetlands outside of the Department's right-of-way. There is some minor maintenance needed on the southern side of the roadway at culverts #1, 2 and #3 (head wall structure #S-2), where it is recommended that a dense mat of water hyacinth be removed to improve flow. There is also an abandoned 55-gallon drum located on the south side of the roadway at culvert #55 (head wall structure #S-23). While this drum is not impeding flow, it should be removed and properly disposed of. Both the vegetation and the drum are outside the Department's right-of-way. They appear to be within Everglades National Park property, although this was not confirmed.

Based on the above findings, no maintenance of the culverts is needed at this time.
As mentioned previously, the Department is proceeding with plans to install two stadia adjacent to the canal, which will allow our maintenance personnel to regularly monitor water levels next to Tamiami Trail in this area.

We hope this information is helpful. If there are any questions regarding this report please call me at (305) 470-5220.

Sincerely,

Barbara B. Culhane

Barbara B. Culhane, A.I.C.P.
District Environmental Administrator

cc: Richard Ring, ENP
Gary Evink, FDOT Central Office
Ron Steiner, FDOT Maintenance
Mike Ciscar, FDOT Environmental Mgmt
Marjorie Bixby, FDOT Environmental Mgmt.

TAMIAMI TRAIL CULVERT SURVEY REPORT
S.R. 90/U.S. 41/TAMIAMI TRAIL

FROM STATION 708+10.28 (M.P. 13.871, WEST OF KROME AVENUE)

TO STATION 1299+46.28

IN MIAMI-DADE COUNTY

FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT SIX

MAY, 1999

INTRODUCTION

The objective of this report is to provide a summary of our recent inspections of cross culverts under S.R. 90/U.S. 41/Tamiami Trail. There are a total of fifty-five (55) pipe culverts under Tamiami Trail with 37 headwall structures (north and south of the roadway) at nineteen (19) locations. They are located in an eleven (11) mile section of Tamiami Trail west of S.R. 997/S.W. 177 Ave/Krome Avenue. The typical structure is a group of three steel-reinforced concrete pipes in a north-south orientation (under the road) between two concrete headwalls that are orientated parallel to the road. Sample plan details of the culverts and structures are included with this report (see Attachment 1).

METHODOLOGY

The field inspections were conducted on February 23 and 24, 1999, by two biologists from Consulting Engineering & Science, Inc. Two goals of the inspections were characterizing any obstructions to the effective operation of the culverts and marking the culvert locations for any warranted FDOT maintenance crew activities. Potential obstructions due to wetland vegetation or sedimentary buildup in front of the pipes on either side of the roadway were investigated. We also noted the shape and approximate diameter of the pipes, as well as their general hydrologic operating conditions. Each location was marked by painting the structure number on the headwall and on the asphalt beneath the guardrail on both the north and south road shoulders. In addition, a numbered wooden stake flagged with pink survey tape was placed in front of the headwalls. Representative photographs and a table summarizing our findings are enclosed (see Attachments 2 and 3, respectively).

RESULTS

The overall condition of the culverts is good and no structural problems were observed. No culverts were observed with obstructions from substantial sediment, debris, or vegetation build-up inside of, or immediately adjacent to, the pipe openings. A southern flow of water was observed at each location, with rates varying from slow (noticeable by drifting periphyton) to rapid (with visibly turbulent water). Water was observed discharging mainly into shallow expanses of water surrounded by densely vegetated wetlands adjacent to the southern roadway shoulder (within Everglades National Park). However, several culverts discharged into dredged channels or sloughs (utilized as airboat docks and navigation channels at tourist establishments) which were relatively clear of vegetation and exhibited rapid flow rates.

The slow flow rates were observed at culvert locations that initially discharged to deep (3 to 4 foot depths) dredged water areas in front of southern headwalls. These dredged areas appeared to extend between 15 and 30 feet south of the discharge structures (based upon visual observations at several locations where vegetation did not obscure the view). However, the area then generally transitions at a steep slope to shallow-water (approximately 1 foot), densely vegetated wetlands to the south of Tamiami Trail.

Yellow cow lilies (Nuphar sp.) are the predominant emergent vegetative cover in front of the culverts. They occur in sparse (5 to 30 percent of surface water area) to moderate (30 to 70 percent) coverages. Other native, non-invasive aquatic vegetation present in front of the culverts included: bladderworts (Utricularia sp.), tape-grass (Vallisneria americana), and Illinois pondweed (Potamogeton illinoensis). Invasive exotic species present in front of the culverts included: water hyacinth (Eichhornia crassipes), fanworts (Cabomba sp.), and Hydrilla (Hydrilla verticillata). Only Culverts No. 1, 2, & 3 on the southside of the roadway (Structure No. S-2) had openings obstructed by a dense mat of vegetation (water hyacinth). However, based on construction plans, the FDOT right-of-way ends at the headwall at this location.

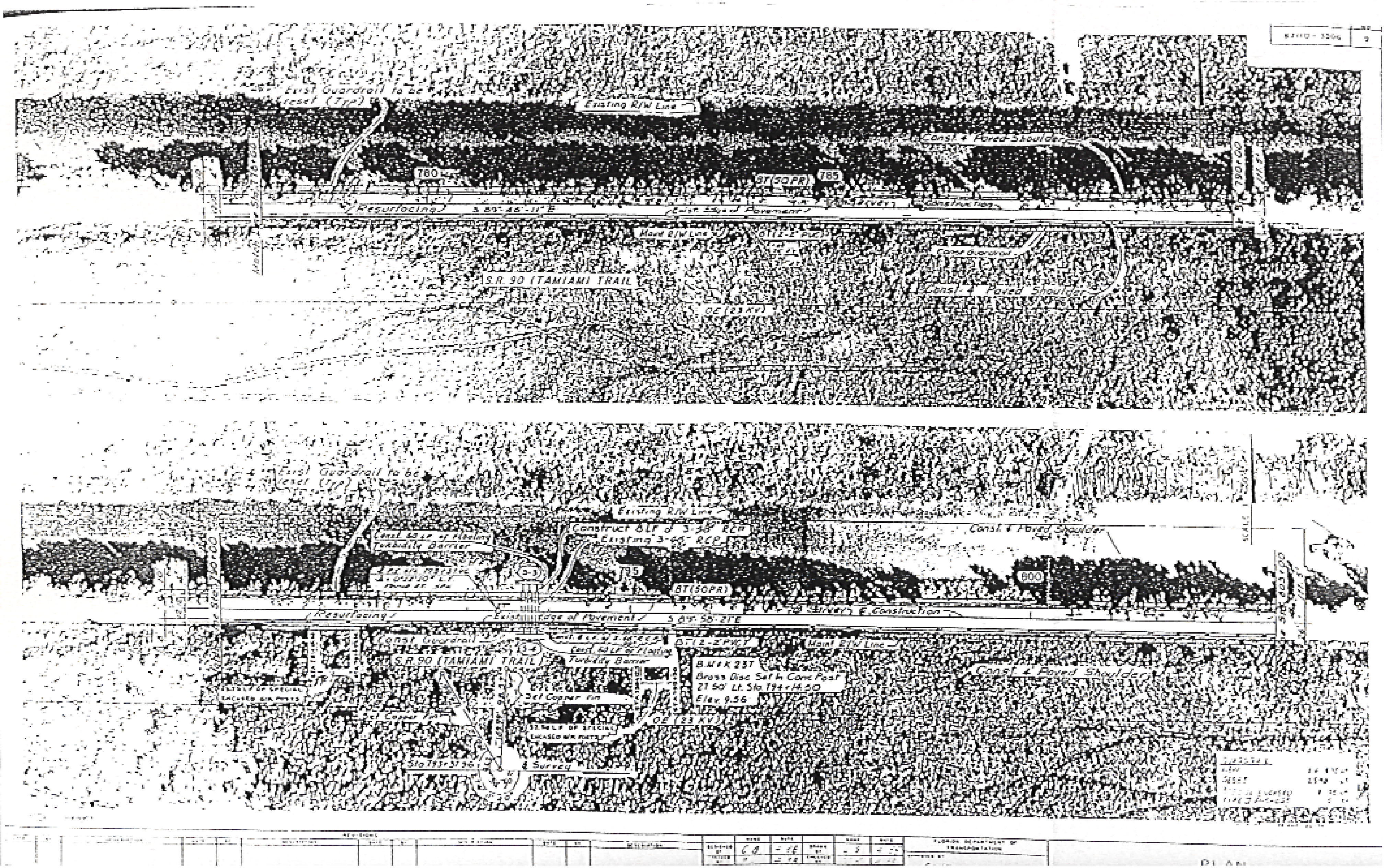
DISCUSSION

Based on our observations, it appears that the determining factor for flow rate through the culverts is hydrologic and not due to vegetation, debris, or sediment build-up. Rapid flow rates coincide with dredged waterways south of the culverts and restricted flow rates are associated with shallow water wetlands outside of FDOT right-of-way.

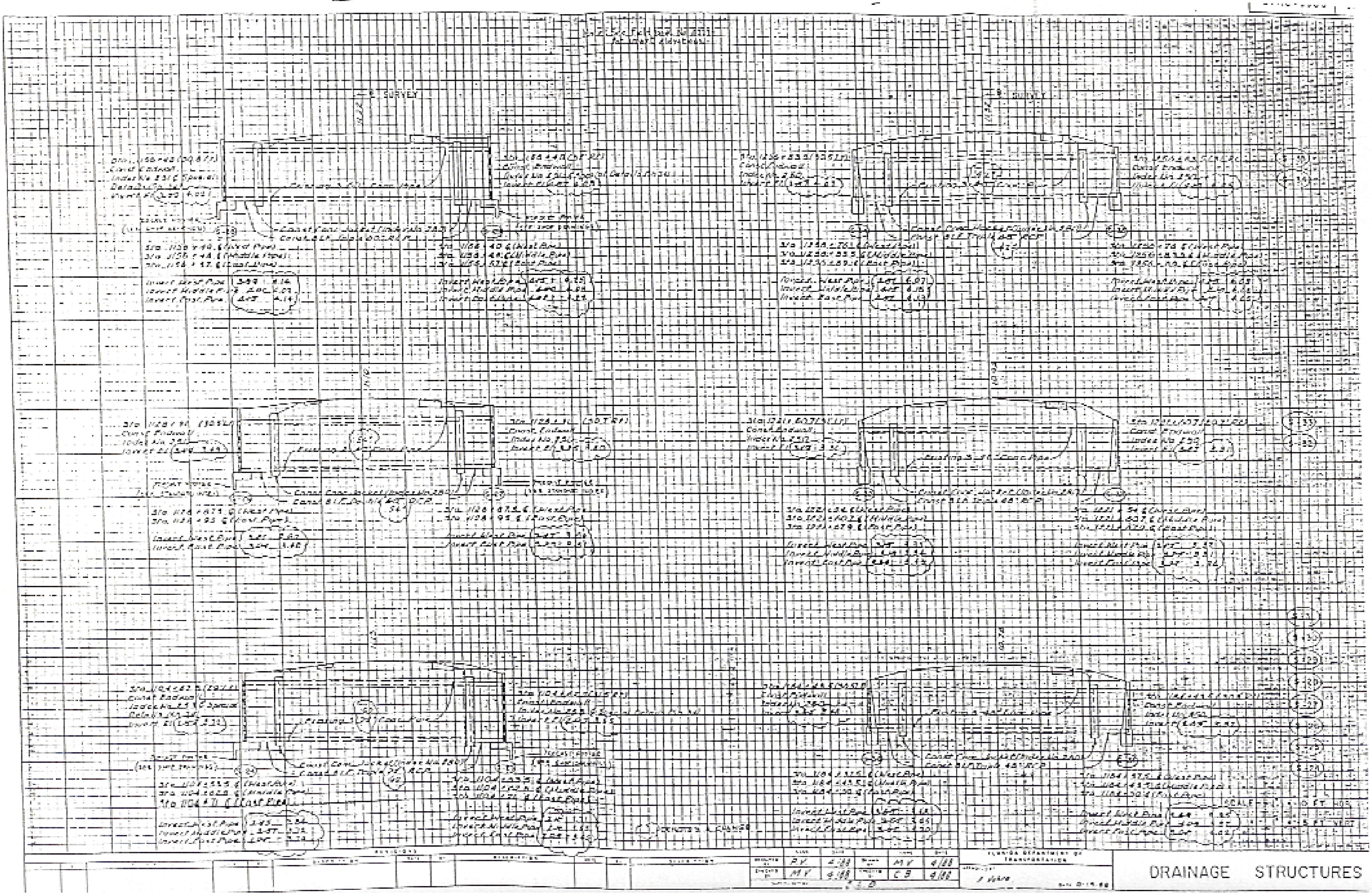
The mat of water hyacinth in front of Culverts 1, 2, & 3 (Structure No. S-2), located at the southern toe-of-slope near the western limits of the survey (M.P. 13.871) should be removed in order to improve flow at these culverts. This vegetation is outside of the FDOT right-of-way. It appears to be within Everglades National Park right-of-way, however this has not been confirmed. In addition, Culvert No. 35 (Structure No. S-23) has a 55-gallon drum which should be removed from the water in front of the pipe opening. This drum is outside of the FDOT right-of-way. Culvert No. 40 (Structure No. S-26) had cattails sucked into the pipe at this location but they did not appear to restrict water flow.

ATTACHMENT 1

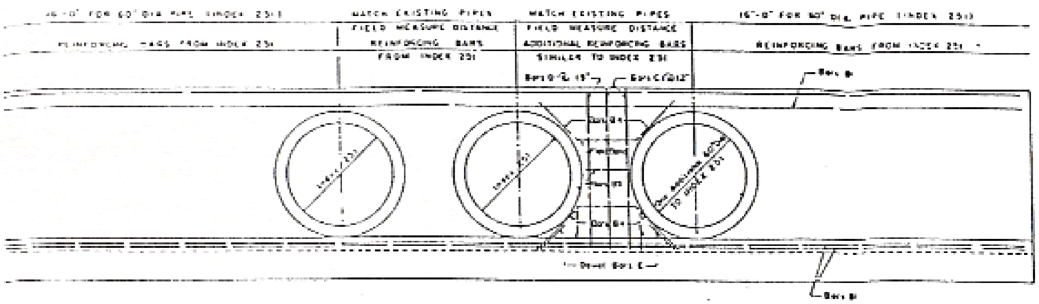
SAMPLE CONSTRUCTION PLAN SHEETS



Exist Guardrail to be Reset (Typ)
Existing R/W Line
Const. 4' Paved Shoulder
780
785
BT(50PR)
Resurfacing
S 89°-46'-11" E
Exist Edge of Pavement
Const. Guardrail
S.R. 90 (TAMIAMI TRAIL)
OE (23 KV)
Exist Guardrail to be Reset (Typ)
Existing R/W Line
Construct 8 LF of 3-36" RCP
Existing 3-36" RCP
Const. 4' Paved Shoulder
800
BT(50PR)
Resurfacing
Exist Edge of Pavement
S 89°-56'-21" E
Survey & Construction
Maint R/W Line
S.R. 90 (TAMIAMI TRAIL)
Turbidity Barrier
B.M. # K 237
Brass Disc Set In Conc Post
27.50' Lt. Sta. 794+14.50
Elev. 9.56
Set Copper Pin
OE (23 KV)
Sta 793+37.56
Survey
FLORIDA DEPARTMENT OF TRANSPORTATION
PLAN



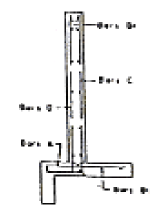
SURVEY
FLORIDA DEPARTMENT OF TRANSPORTATION
DRAINAGE STRUCTURES



ELEVATION OF TRIPLE 60" DIAMETER CONCRETE PIPE

N.T.S.

Reinforcing Steel Required in Addition to Index 251 (For Double Pipes).
See Index 251 For Dimensions and Reinforcing Details.
For Drainage Structures S-16 and S-17 Consisting of 4-60" Dia. Pipes, Repeat the Additional Reinforcing Bars Marked Shown Above. The Bill of Additional Material is Tabulated Below.



TYPICAL SECTION THRU ENDWALL

N.T.S.

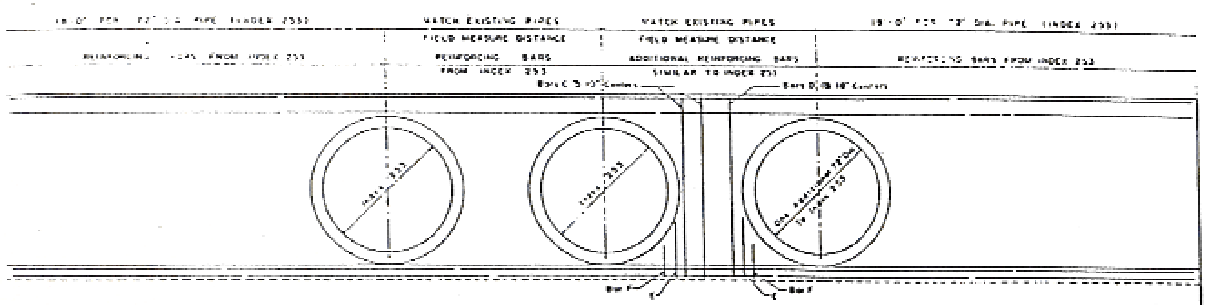
See Index 251 for All Dimensions and Reinforcing

BILL OF ADDITIONAL REINFORCING STEEL 3-60" PIPE					
MARK	SIZE	NO. REQ'D	LENGTH	LOCATION	BENDING
A	4	9	4'-2"	Footing	Straight
B	4	8	* 48.9'	Footing & Wall	Straight
B1	4	4	6'-0"	Wall	Field Bend
B3	4	2	12'-2"	Wall	Straight
C	4	3	5'-5"	Footing & Wall	Bend
D	4	3	7'-10"	Footing & Wall	Straight
E	4	8	1'-8"	Footing & Wall	Straight

* FIELD MEASURE (APPROXIMATE LENGTH SHOWN)

ESTIMATED ADDITIONAL QUANTITIES 3-60" PIPE			
ITEM	UNIT	RCP	—
Concrete Class II	Cu. Yd.	2.32	—
Reinforcing Steel	LB.	166	—

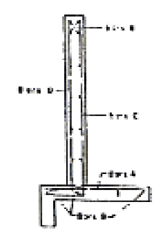
NOTE: ADD THESE QUANTITIES TO THOSE SHOWN IN INDEX 251



ELEVATION OF TRIPLE 72" DIAMETER CONCRETE PIPE * (VOID)

N.T.S.

Reinforcing Steel Required in Addition to Index 253 (For Double Pipes).
See Index 253 For Dimensions and Reinforcing Details.



TYPICAL SECTION THRU ENDWALL

N.T.S.

* The endwall for a 72" Diameter Concrete Pipe was not needed because their are no 72" Pipes with in the Project Limits.

NOTES

1- FOR TRIPLE 48" DIA. PIPES SEE INDEX 250 (MULTIPLE PIPES).

2- THIS SHEET IS TO BE USED IN CONJUNCTION WITH INDEX 251 AND 253.

3- FOR DRAINAGE STRUCTURES S-16 AND S-17 CONSISTING OF 4-60" DIA. PIPES REPEAT THE ADDITIONAL REINFORCING BARS, TWICE, AS SHOWN ABOVE IN TRIPLE PIPE ELEVATION.

4- COST ASSOCIATED WITH THE CONSTRUCTION OF THE ENDWALLS (INCLUDING COFFERDAMS, DEWATERING) SHALL BE INCLUDED IN THE COST OF CLASS II CONCRETE.

* (VOID)

BILL OF ADDITIONAL REINFORCING STEEL 3-72" PIPE					
MARK	SIZE	NO. REQ'D	LENGTH	LOCATION	BENDING
A	5	20	4'-11"	Footing	Straight
B	4	8	* 55.6'	Footing & Wall	Straight
C	5	9	10'-5"	Wall	Bend
D	4	7	8'-7"	Wall	Straight
E	4	4	2'-6"	Wall	Straight
F	4	4	1'-6"	Wall	Straight

* FIELD MEASURE (APPROXIMATE LENGTH SHOWN)

* (VOID)

ESTIMATED ADDITIONAL QUANTITIES 3-72" PIPE			
ITEM	UNIT	RCP	—
Concrete Class II	Cu. Yd.	5.02	—
Reinforcing Steel	LB.	350	—

NOTE: ADD THESE QUANTITIES TO THOSE SHOWN IN INDEX 253

BILL OF ADDITIONAL REINFORCING STEEL 4-60" PIPE					
MARK	SIZE	NO. REQ'D	LENGTH	LOCATION	BENDING
A	4	18	4'-2"	Footing	Straight
B	4	16	* 57.5'	Footing & Wall	Straight
B1	8	4	*2'-6"	Wall	Field Bend
B3	4	4	*2'-3"	Wall	Straight
C	4	6	5'-5"	Footing & Wall	Bend
D	4	6	7'-10"	Footing & Wall	Straight
E	4	16	1'-8"	Footing & Wall	Straight

* FIELD MEASURE (APPROXIMATE LENGTH SHOWN)

ESTIMATED ADDITIONAL QUANTITIES 4-60" PIPE			
ITEM	UNIT	RCP	—
Concrete Class II	Cu. Yd.	4.64	—
Reinforcing Steel	LB.	332	—

NOTE: ADD THESE QUANTITIES TO THOSE SHOWN IN SHOWN IN INDEX 251

ATTACHMENT 2

PHOTOGRAPHS

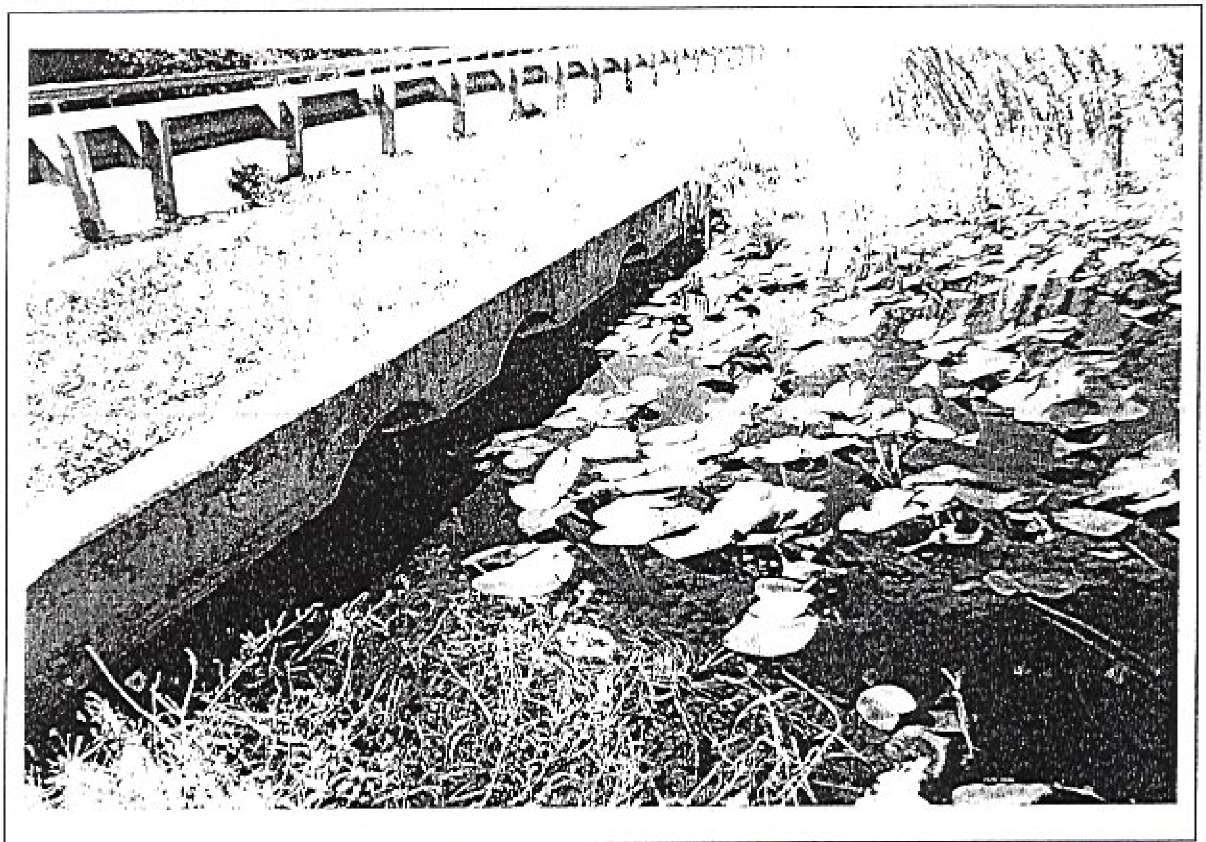


Photo 1: Typical northern culvert opening headwall intaking water from adjacent Tamiami Canal with slow flow through moderate wetland and aquatic vegetation.

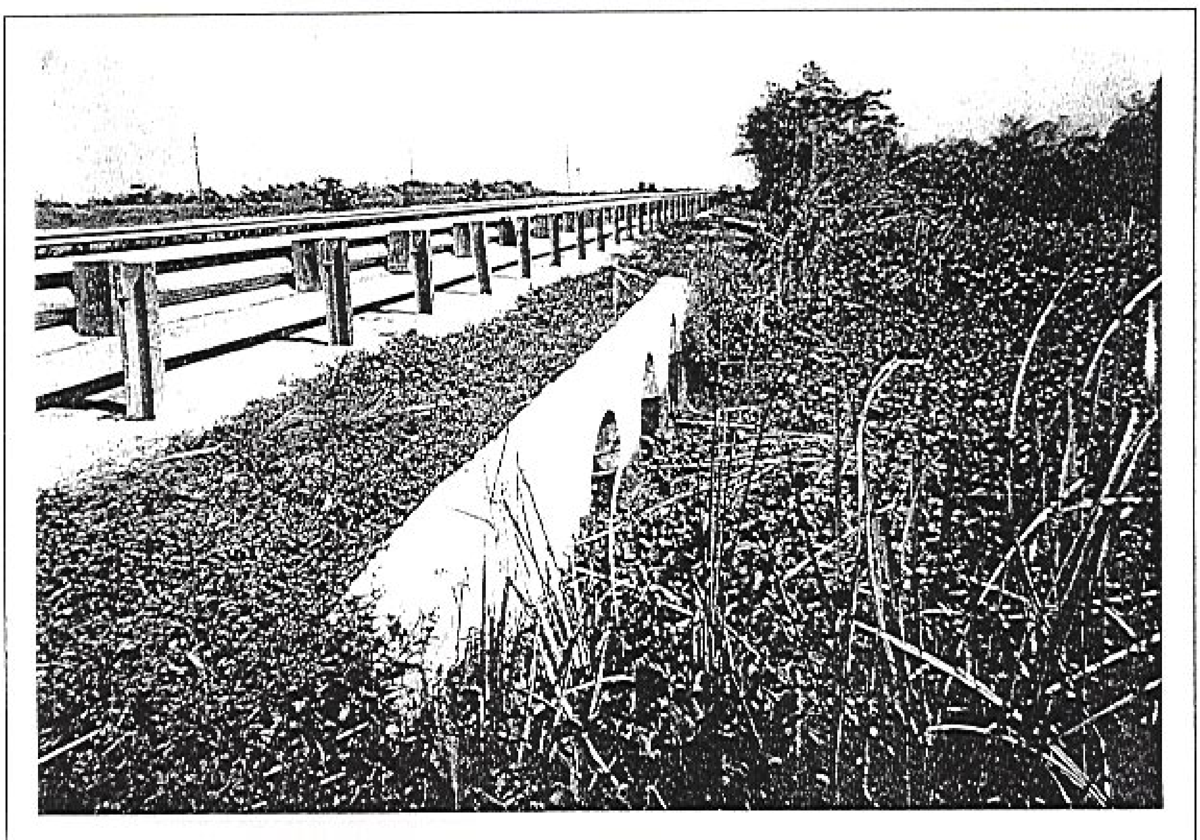


Photo 2: Culverts No. 1, 2, & 3 (Structure S-2), south of roadway, with a slow water discharge into a dense mat of exotic water hyacinth.

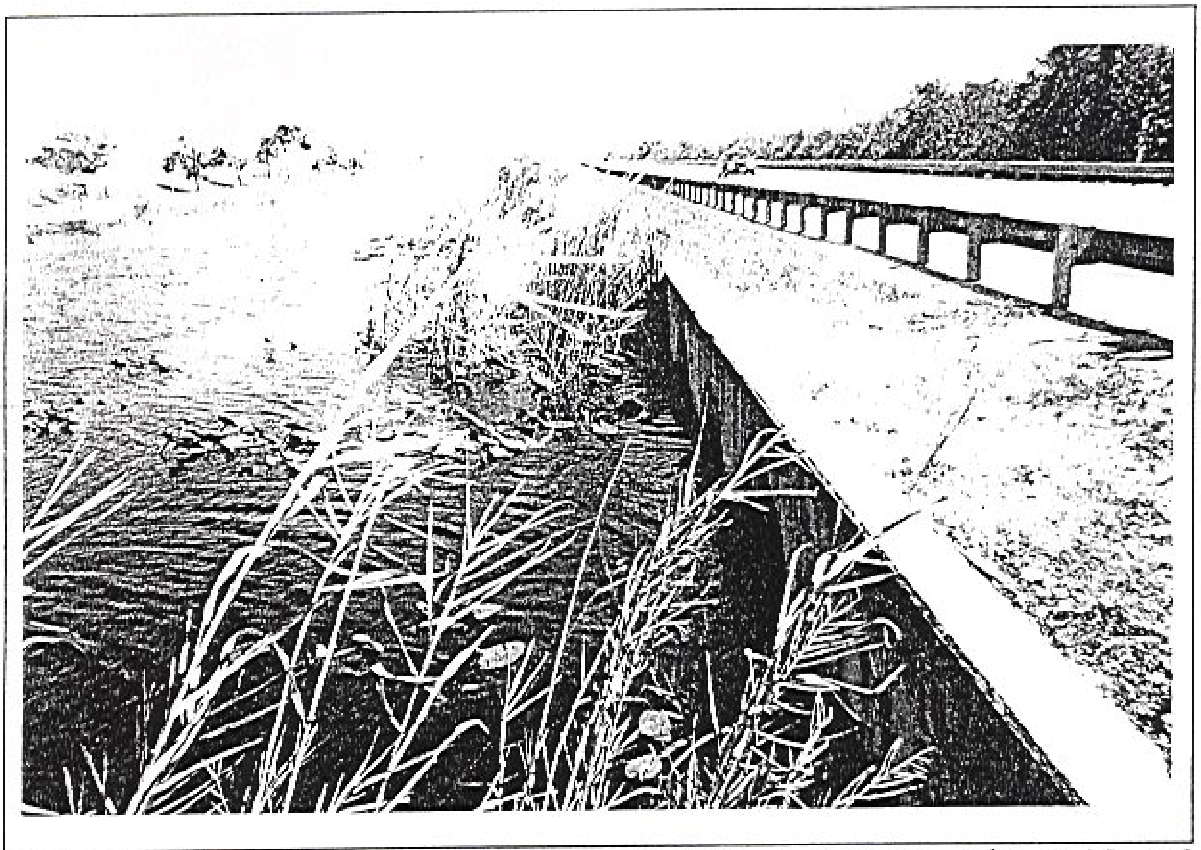


Photo 3: Example of northern culvert openings 1/2 full of water, with moderate to rapid flow, and sparse vegetation.

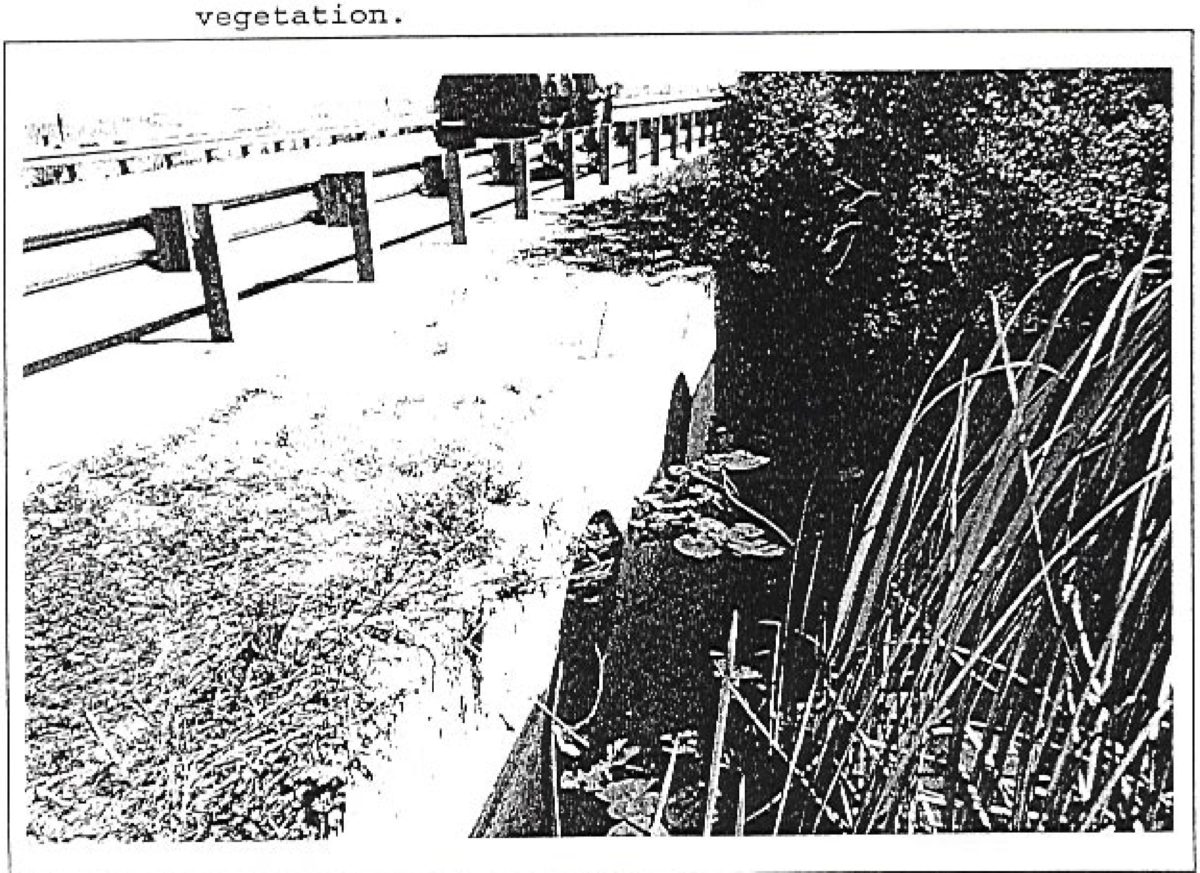


Photo 4: Example of 2/3 full southern culvert openings discharging a slow to moderate flow into sparse/ mainly open water dredged area (dredging limited to headwall vicinity).

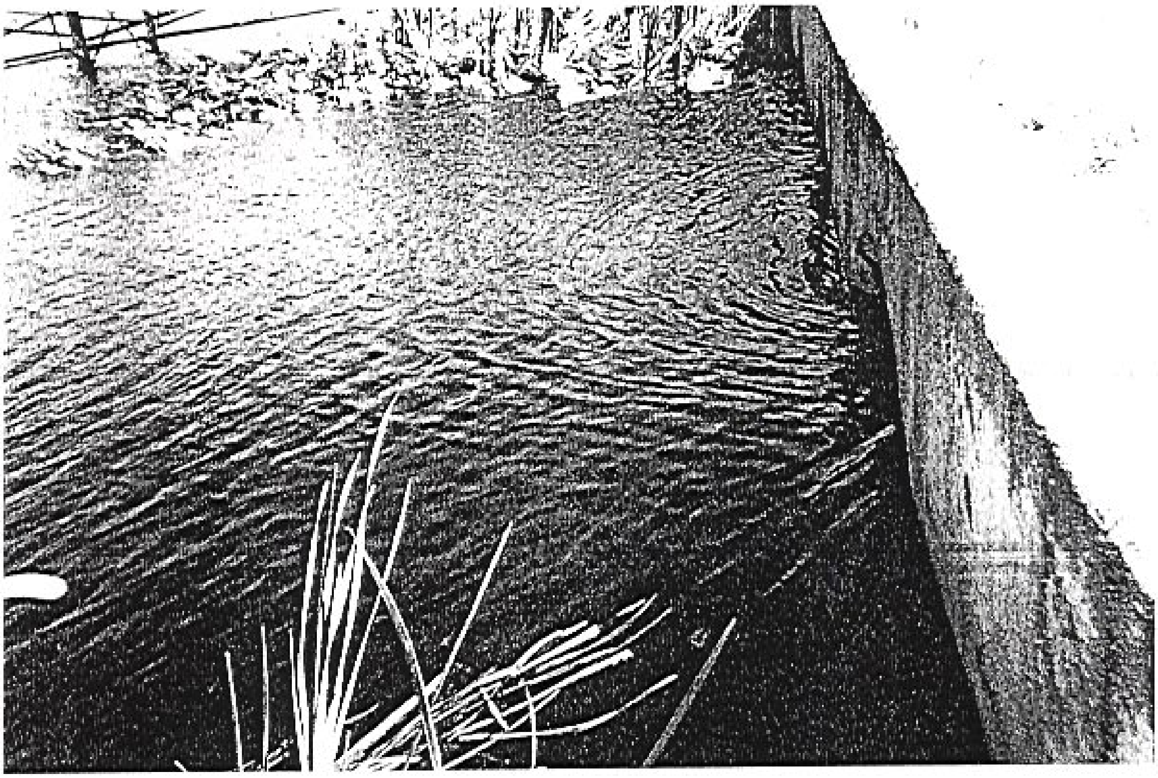


Photo 5: Example of 2/3 full northern culvert openings with a moderate water intake rate and open water - no vegetation.

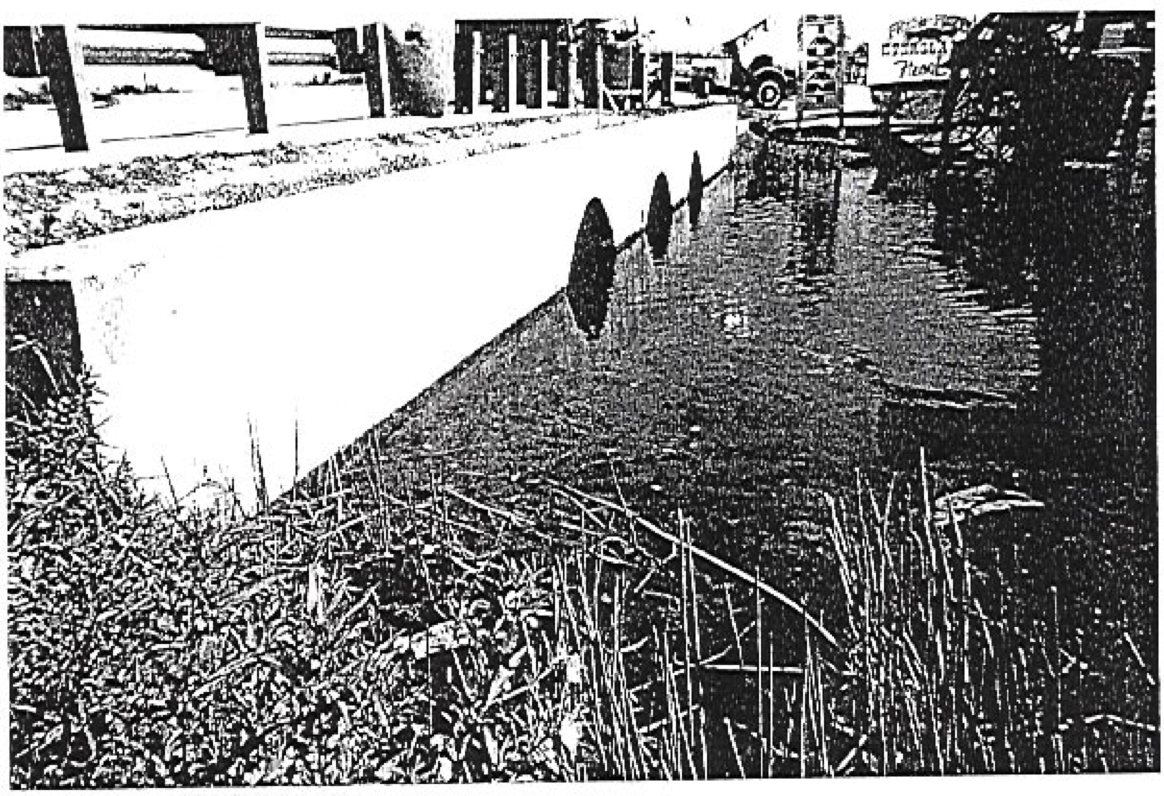


Photo 6: Example of 2/3 full southern culvert openings with a slow to moderate discharge of water to an airboat docking area/navigation channel, no vegetation in open water.

ATTACHMENT 3

TABLE 1

TABLE 1

S.R. 90 / U.S. 41 / TAMIAMI TRAIL CROSS CULVERTS

Culverts	Headwall Structure No.	Wetland Vegetation	Pipe Descriptions: Shape	Pipe Descriptions: Avg. Diameter (in inches)	Operating Conditions	Sedimentation Inside Pipe Openings	Notes
1, 2, 3	S-1 (North)	Native/ Exotic	Round	44	open, 1/2 full, slow southern flow	Minimal	Native species = Yellow cow lilies and Illinois pondweed in front of culverts (moderate density) with saltbush, arrowhead, sawgrass and giant leather fern at the headwall abutments. Exotic species = Fanwort in front of culverts (moderate density).
	S-2 (South)	Exotic	Round	45	open, 1/2 full, slow southern flow	Minimal	Exotic species = Water hyacinth in a solid, floating mat (high density). Tire in front of center pipe, grasses at headwall abutments.
4, 5, 6	S-3 (North)	Native/ Exotic	Round	44	open, 2/3 full, slow southern flow	Minimal	Native species = Yellow cow lilies and Illinois pondweed in front of culverts (moderate density). Exotic species = Torpedo grass at headwall abutments.
	S-4 (South)	Native/ Exotic	Round	48	open, 2/3 full, slow southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density). Exotic species = Water hyacinth (high density) behind lilies, approximately 20 feet from the culverts.
7, 8, 9	S-5 (North)	Native/ Exotic	Round	48	open, full, slow southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density). Saltbush, arrowhead, pond apple, hydrocotyl, and spleenwort at abutments. Exotic species = Torpedo grass and fanwort at abutments.
	S-6 (South)	Native/ Exotic	Round	48	open, full, slow/ moderate southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density). Nuisance/Exotic species = Fanworts in front of culverts (moderate density). Cattails and grasses at the abutments.

Culverts	Headwall Structure No.	Wetland Vegetation	Pipe Descriptions		Operating Conditions	Sedimentation Inside Pipe Openings	Notes
			Shape	Avg. Diameter (in inches)			
10, 11, 12	S-7 (North)	Native/ Exotic	Round	48	open, full, slow southern flow	Minimal	Native species = Yellow cow lilies and Illinois pondweed in front of culverts (moderate density). Saltbush, broomsedge, and grasses at the abutments. Nuisance/Exotic species = Cattails and torpedo grass at abutments.
	S-8 (South)	Native/ Exotic	Round	48	open, full, slow/ moderate southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density), pickerelweed is present among lilies. Grasses, broomsedge, and willow at the abutments. Nuisance/Exotic species = Cattails at the abutments.
13, 14, 15	S-9 (North)	Native/ Exotic	Round	50 (North, concrete headwall) 54 (South, 3 corrugated steel pipes)	open, 1/2 full, rapid southern flow	Minimal	Only 1 structure number, steel pipes with no headwall on southside. Native species = Yellow cow lilies, tape grass and Illinois pond weed (moderate densities) in front of culverts with sections of open water. Pond apple, giant spikerush and arrowhead at the abutments. Exotic species = Torpedo grass at the abutments.
16, 17, 18	S-10 (North)	Native/ Exotic	Round	44	Open, full, moderate southern flow	Minimal	Native species = Yellow cow lilies and Illinois pond weed in front of culverts (moderate density). Pickerelweed at N.E. abutment. Nuisance/Exotic species = Fanwort in front of culverts (moderate density) and common reed at N.W. abutment.
	S-11 (South)	Native	Round	42	Open, 3/4 full, moderate southern flow	None	Native species = Yellow cow lilies in front of culverts (moderate density) with cattails and pickerelweed further south in shallow waters. Giant leather fern at S.E. abutment.
19, 20, 21	S-12 (North)	Native/ Exotic	Round	48	Open, 1/2 full, slow/moderate southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density) with spikerush, broomsedge, arrowhead, pond apple, giant leather fern, and shield ferns at abutments. Nuisance/Exotic species = Torpedo grass and pickerelweed at abutments.

Culverts	Headwall Structure No.	Wetland Vegetation	Pipe Descriptions		Operating Conditions	Sedimentation Inside Pipe Openings	Notes
			Shape	Avg. Diameter (in inches)			
19, 20, 21	S-13 (South)	Native/ Exotic	Round	48	Open, 1/2 full, moderate southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density) with pond apples, giant leather ferns, and shield ferns at abutments. Nuisance/Exotic species = Cattails in front of culverts (moderate density) with Brazilian pepper at abutments.
22, 23, 24	S-14 (North)	Native/ Exotic	Round	48	Open, 3/4 full, slow/moderate southern flow	Minimal	Native species = Yellow cow lilies and Illinois pondweed in front of culverts (moderate density) with sawgrass, arrowhead, and primrose willow at abutments. Nuisance/Exotic species = Fanwort in front of culverts (moderate density), with cattails, pickerelweed, and common reed at abutments.
	S-15 (South)	Native/ Nuisance	Round	48	Open, 3/4 full, slow southern flow	None	Native species = Yellow cow lilies, scattered in open water in front of culverts (sparse density), with flatsedge at one abutment. Nuisance species = Common reed at abutments.
25, 26, 27, 28	S-16 (North)	Native/ Exotic	Round	54	Open, full, slow/ moderate southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density), with giant spikerush, mowed pond apple saplings and sawgrass clumps at the abutments. Exotic species = Fanworts in front of culverts (moderate density).
	S-17 (South)	Native	Round	54	Open, full, slow southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density) and at abutments, with arrowhead, coastal plain willow, arrowhead, and giant spikerush also at abutments. Nuisance species = Common reed at one abutment.
29, 30, 31	S-18 (North)	Native/ Exotic	Round	57	Open, full, moderate southern flow	Minimal	Native species = Mostly open water in front of culverts, some yellow cow lilies in front of culverts (sparse density), with some spikerush at abutments. Exotic species = Mostly open water in front of culverts, some fanworts in front of culverts (sparse density) and at abutments, with torpedo grass also present at the abutments.

Culverts	Headwall Structure No.	Wetland Vegetation	Pipe Descriptions		Operating Conditions	Sedimentation Inside Pipe Openings	Notes
			Shape	Avg. Diameter (in inches)			
29, 30, 31	S-19 (South)	Native/ Exotic	Round	54	Open, full, moderate southern flow	Minimal	Native species = Mostly open water in front of culverts, some yellow cow lilies in front of culverts (sparse density). Exotic species = Mostly open water in front of culverts, some fanworts in front of culverts (sparse density) with some mowed torpedo grass at abutments.
32, 33, 34	S-20 (North)	Native/ Exotic	Round	45	Open, full, slow southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density) with mowed primrose willow and giant leather ferns at abutments. Exotic species = Fanworts in front of culverts (moderate density) with cattails and torpedo grass at abutments.
	S-21 (South)	Native/ Exotic	Round	44	Open, full, slow southern flow	Minimal	Native species - Yellow cow lilies in front of culverts (moderate density) with coastal plain willow, pond apple, red bay, giant leather fern, saltbush, and various grasses at abutments. Exotic species - Fanworts in front of culverts (moderate density).
35	S-22 (North)	Native/ Exotic	Round	58	Open, full, slow southern flow	Minimal	Native species = Yellow cow lilies in front of culverts (moderate density) with broomsedge, saltbush, arrowhead, primrose willow, and various ferns at abutments. Exotic/Nuisance species - Fanworts in front of culverts (moderate density) with mowed torpedo grass and common reeds at abutments.
	S-23 (South)	Native/ Exotic	Round	58	Open, full, no/slow southern flow	Minimal	Native species = Yellow cow lilies in front of culvert (moderate to high density) with sawgrass, arrowhead, giant spikerush, and various ferns at abutments. Exotic/Nuisance species - Fanworts in front of culvert (moderate to high density) with torpedo grass, hydrilla, Brazilian pepper, common reed, and cattails at abutments. Additionally, an open-ended, 55-gallon drum is in the water, approximately 1 meter south of the culvert opening.

Culverts	Headwall Structure No.	Wetland Vegetation	Pipe Descriptions: Shape	Pipe Descriptions: Avg. Diameter (in inches)	Operating Conditions	Sedimentation Inside Pipe Openings	Notes
36, 37, 38	S-34 (North)	Native/ Exotic	Round	53	Open, 3/4 full, moderate/ rapid southern flow	Minimal	<u>Native species</u> = No vegetation in front of culverts, open water with yellow cow lilies and giant spikerush at the abutments. <u>Exotic/Nuisance species</u> = Open water in front of the culverts, with fanworts and cattails at the abutments.
	S-35 (South)	Native/ Exotic	Round	53	Open, 3/4 full, moderate/ rapid southern flow	Minimal	<u>Native species</u> = Open water in front of culverts, with bladderwort, giant spikerush, pennywort, and primrose willow at the abutments. <u>Exotic species</u> = Fanworts and hydrilla in water BETWEEN the culverts, <u>not</u> in front of the culverts, with mowed torpedo grass at the abutments.
39, 40	S-36 (North)	Native/ Exotic	Round	48	Open, full, moderate southern flow	Minimal	<u>Native species</u> = Mainly open water in front of culverts, with some Illinois pondweed (moderate density), and with yellow cow lilies at the abutments. <u>Nuisance/Exotic species</u> = Cattails confined mainly to the abutments with common reeds and torpedo grass.
	S-37 (South)	Native/ Exotic	Round	48	Open, full, moderate southern flow	Minimal	<u>Native species</u> = Mainly open water in front of culverts, with some yellow cow lilies (sparse density), and coastal plain willow at the abutments. <u>Exotic/Nuisance species</u> = Hydrilla and cattails (sparse density) in open water with Brazilian pepper and cattails at the abutments.
41, 42, 43	S-38 (North)	Native/ Exotic	Round	56	Open, 1/2 full, slow/moderate southern flow	Minimal	<u>Native species</u> = Yellow cow lilies and Illinois pondweed in front of culverts (sparse density). <u>Exotic/Nuisance</u> = Fanworts in front of culverts (sparse density) with torpedo grass, cattails, and common reed at abutments.
	S-39 (South)	Native/ Exotic	Round	54	Open, 1/2 full, moderate southern flow	None	<u>Native species</u> = Yellow cow lilies in BETWEEN the culverts, <u>not</u> in front of the culverts (moderate density), with giant leather fern, coastal plains willow, broomsedge, and white beggar ticks at the abutments. <u>Exotic species</u> = Cabomba in BETWEEN the culverts, <u>not</u> in front of the culverts (moderate density), with Brazilian pepper and torpedo grass at the abutments.

Culverts	Headwall Structure No.	Wetland Vegetation	Pipe Descriptions		Operating Conditions	Sedimentation Inside Pipe Openings	Notes
			Shape	Avg. Diameter (in inches)			
44, 45, 46	S-30 (North)	Native/ Exotic	Round	48	Open, full, moderate southern flow	Minimal	<u>Native species</u> = Yellow cow lilies and Illinois pondweed in front of culverts (moderate density) with white beggar ticks, arrowheads, as well as mowed leather and shield ferns at the abutments. <u>Exotic/Nuisance</u> = Fanworts in front of culverts (moderate density) with torpedo grass at the abutments.
	S-31 (South)	Native/ Exotic	Round	48	Open, full, moderate southern flow	Minimal	<u>Native species</u> = Yellow cow lilies in front of culverts (moderate density) and at the abutments. <u>Exotic/Nuisance</u> = Fanworts in front of culverts (moderate density) with napier grass at the abutments.
47, 48, 49	S-32 (North)	Native/ Exotic	Round	48	Open, full, moderate/rapid southern flow	Minimal	<u>Native species</u> = Yellow cow lilies and Illinois pondweed in front of culverts (moderate density) with white beggar ticks, arrowheads, and bladderworts at the abutments. <u>Exotic/Nuisance</u> = Fanworts in front of culverts (moderate density) with torpedo grass at the abutments.
	S-33 (South)	Native/ Exotic	Round	44	Open, full, moderate/rapid southern flow	Minimal	<u>Native species</u> = Mainly open water in front of culverts, with some yellow cow lilies (sparse density) and some coastal plain willow, white beggar ticks, lantana, and broomsedge at the abutments. <u>Exotic/Nuisance species</u> = Hydrilla (sparse density) in open water with fanworts and hydrilla at the abutments.
50, 51, 52	S-34 (North)	Native/ Exotic	Round	38	Open, full, rapid southern flow	None	<u>Native species</u> = Mainly open water with some Illinois pondweed (sparse density) in front of culverts. <u>Exotic/Nuisance species</u> = Hydrilla (sparse density) in open water with cattails, torpedo grass and hydrilla at the abutments.
	S-35 (South)	Native/ Exotic	Round	38	Open, full, rapid southern flow	None	<u>Native species</u> = Open water in front of culverts, with yellow cow lilies and coastal plain willow at the abutments. <u>Exotic/Nuisance species</u> = Mainly open water in front of the culverts with hydrilla, cattails, and common reed at the abutments.

Culverts	Headwall Structure No.	Wetland Vegetation	Pipe Descriptions		Operating Conditions	Sedimentation Inside Pipe Openings	Notes
			Shape	Avg. Diameter (in inches)			
53, 54, 55	S-36 (North)	Native/ Exotic	Round	48	Open, full, rapid southern flow	None	Native species = Mainly open water in front of culverts with yellow cow lilies, Illinois pondweed, arrowheads, and white beggar ticks at the abutments. Exotic species = Mainly open water in front of culverts but with some strands of hydrilla sucked into the intake opening of at least one culvert and laying flat on the bottom. Panworts and torpedo grass at the abutments.
	S-37 (South)	Native/ Exotic	Round	48	Open, full, rapid southern flow	Minimal	Native species = No vegetation, only open water in front of culverts with flatsedge and coastal plain willow at the abutments. Exotic/Nuisance species = No vegetation, only open water in front of culverts with Brazilian pepper, cattails, hydrilla, and torpedo grass at the abutments.

Florida Department of Transportation

JEB BUSH
GOVERNOR

THOMAS F. BARRY, JR.
SECRETARY

District Six Environmental Management Office
1000 N.W. 111 Avenue, Room 6101
Miami, Florida 33172

May 7, 1999

Richard Bonner, Deputy District Engineer for Project Management
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Bonner:

This is in response to your April 16, 1999 letter received April 22, 1999 regarding the Tamiami Trail project feature of the U.S. Army Corps of Engineers' (the "Corps") Modified Water Deliveries to Everglades National Park Project.

Since our February 23, 1999 meeting with your staff, a coordination team has been established within the Florida Department of Transportation (the "Department") to assist in reviewing alternatives and plans developed for this project. A list of team members along with their responsibilities and contact information is attached. A number of these team members met to discuss your most recent letter and have assembled the information provided below. The information in this letter is divided into two parts: the first part contains general comments regarding the project, and the second part contains specific responses to questions raised in your letter.

General Comments

We were concerned to read in your letter that your process is on hold pending information from our agency, since your staff stated at the conclusion of our February 23rd meeting that they would proceed with additional alternatives analysis through March and early April, and subsequently provide that information to the Department for review. As we committed in the February meeting, our Traffic Operations Division proceeded with obtaining all traffic Level of Service (LOS) and crash data for this portion of Tamiami Trail and performed a detailed analysis of this data in order to determine the possible need for four-laning of the roadway or for provision of a median separator. That work was completed April 26, 1999 and the results are provided below.

As expressed at the February 23rd meeting and in our July 31, 1998 teleconference with your staff, we are concerned about the level of major engineering and environmental work involved in developing and analyzing the alternatives for this project, particularly given the ambitious schedule for project implementation. We wish to reiterate our recommendation made in last summer's teleconference that the Corps hire a qualified consulting firm with expertise in transportation engineering and environmental analysis to perform the substantial work involved in developing the project alternatives. While the Department's coordination team can assist with review of alternatives and plans, and serve as a source of information and contacts, we feel that a dedicated consultant team is essential to completing the substantial work involved in developing and designing this project within the established schedule. To that end, we are providing a list of consulting firms which are prequalified by the Department to perform Project Development and Environmental (PD&E) (i.e., National Environmental Policy Act [NEPA]) alternatives analysis studies and prepare project master plans. This is in addition to the attached list of Department-prequalified Final Design firms, which your staff requested at our February 23rd meeting. One advantageous approach would be to consider hiring a single firm qualified not only in PD&E and Final Design, but Construction, Engineering and Inspection (CEI) work as well, since a CEI firm will be needed to inspect the construction contractor's work. In addition, due to the project length, you should consider dividing the project construction into two or three segments in order to expedite this phase by utilizing multiple contractors.

As discussed in February, part of the difficulty in responding to your staff's request for all the environmental, water quality, and design considerations which would need to be incorporated into this project lies in the fact that the decision of which agency (s) will design, construct and fund this project, and which specific funding types will be utilized, has not yet been decided. For example, if the ACOE were to construct and fund this project using Department of Interior (DOI) funds, we do not believe that Section 4 (f) [Title 49 U.S.C., Section 1653(f), as amended in 1983 and codified as 49 U.S.C. Section 303] would apply, as it only applies to agencies within the U.S. Department of Transportation. We do feel that a final legal determination of this issue needs to be made since a U.S. highway is involved, and therefore we will request such a determination and will forward the opinion to you separately. If any FHWA funds were utilized at any stage of this project, however (design, construction, right-of-way acquisition, etc.), Section 4(f) would apply. This includes the potential for direct permanent Section 4(f) impacts, temporary Section 4(f) impacts due to Maintenance of Traffic (MOT) or other construction activities, indirect impacts through changes in access to Section 4(f) lands, and Constructive Use Section 4(f). Section 4(f) lands in the area include Everglades National Park and possibly other publicly owned recreation areas, wildlife or waterfowl refuges, or archaeological or historic sites identified as part of a comprehensive archaeological and cultural resource survey. In any case, you should be aware that if Section 4(f) were determined to apply, it could substantially affect the project's MOT plans, and consequently the preferred alternative alignment, as well as the project schedule.

Similarly, other processes, procedures and permitting requirements may apply if this project is designed and constructed by the Department, which may not apply to a Corps-designed and -constructed facility on our right-of-way. Consequently it is difficult to insure a complete list of all issues and design considerations which should be addressed for this project. For comparison purposes, based on our knowledge of the proposed improvements planned thus far, the standard process which the Department would follow in developing this project would include, at a minimum, the following:

1. **Project Development and Environmental Study Phase**
   --Project scoping phase.
   --Development of detailed project schedule and Public Involvement Plan (PIP).
   --Advanced Notification Package to applicable agencies, organizations and elected officials.
   --Engineering and Environmental data collection & analysis; detailed field surveys for endangered species, wetlands impacts, right-of-way impacts, cultural resource surveys, etc.
   --NEPA alternatives analysis, interagency coordination (including required Endangered Species Act [ESA] Section Seven consultation with the U.S. Fish and Wildlife Service [USFWS]; coordination with the State Historic Preservation Officer [SHPO], etc.)
   --Development of engineering masterplans for various alternatives.
   --Preparation of draft Preliminary Engineering Report (PER) and required environmental documents.
   --Public notice and public involvement (public workshops; public hearing).
   --Selection of preferred alternative.
   --Document revision, completion, circulation and approval.

2. **Final Design Phase**
   --Development of detailed roadway and drainage design plans based on the preferred NEPA alternative.
   --Structural design of retaining walls, bridges, etc., if any.
   --Utility coordination.
   --Right-of-way acquisition; acquisition of construction easements.
   --Additional public involvement as warranted.
   --Environmental document reevaluation and update.
   --Regulatory permitting.
   --Preparation of Technical Special Provisions (TSP's) for inclusion in contract documents.
   --Plans circulation and review.
   --Construction cost estimating.

3. **Construction Phase**
   --Contractor bidding, contract letting and negotiations.
   --Contractor mobilization.
   --Potential utility relocation.
   --Implementation of MOT plans.
   --Project construction and inspection.
   --Potential restoration of MOT area.
   --Wetlands mitigation construction.

Based on the above process, we estimate that with the use of prequalified consulting firms experienced in transportation Project Development and Final Design, and assuming major modifications to the entire 10-mile project area, an accelerated schedule for completion of both the Project Development and Final Design Phases would be two years each, and an accelerated Construction Phase would take approximately two years, for a total of six years. This assumes that the basic type of improvements needed (bridges, culverts, roadway elevation, or some combination of all three) has already been established in the planning phase (i.e., prior to the Project Development Phase). It also does not allow time for consultant selection and contract negotiation, although in the case of Final Design and CEI consultant selection, this process can be performed simultaneously with other project work, in advance of these phases.

As mentioned by your staff in the February 23rd meeting, the Corps may have different processes or permitting requirements which are less restrictive than those followed by the Department. For purposes of responding to your questions, the information provided below is based on what we believe would be the minimum Project Development, environmental, water quality and pavement design considerations, which would apply, regardless of funding or agency involvement.

Response to Questions

1) **Waiver request by the Corps to reduce the two-foot base clearance requirement to a one-foot base clearance requirement:**

The base clearance may be reduced from two feet to one foot for purposes of conceptual alternative development. This clearance will be measured from the design high water elevation to the bottom of the base at the outside edge of shoulder. The clearance reduction is predicated on the use of black base (i.e., asphalt, which is more resistant to flooding than a lime rock base). The design high water elevation needs to be established for each conceptual alternative. For purposes of determining roadway profile grades and pavement layer clearances the design high water will be the expected water elevation resulting from a 75 year recurrence interval, or approximately 4,000 cubic feet per second (cfs). As your staff discussed in the February 23rd meeting, they anticipate a 4,000 cfs flow event, flooding the roadway base for two to three days

Based on the design high water elevation provided by the Corps of 9.5 feet NGVD (derived from the occasional 4,000 cfs flow), a minimum profile grade elevation at the roadway crown of 12 feet would be required.

3) Request by the Corps to use black base at a one-foot thickness instead of lime rock at a two-foot thickness) as a subgrade material in alternatives developed for Tamiami Trail:
As we discussed in the February 23rd meeting, the use of black base is acceptable, although typically more expensive than lime rock. The pavement design above is based on the use of black base and a one-foot clearance from its bottom to the design high water elevation.

4) Waiver request by the Corps to reduce the two-foot bridge drift clearance to a one-foot bridge drift clearance:
We concur in the reduction of the bridge drift clearance from two feet to one foot for purposes of conceptual alternative development. This clearance will be measured from the design high water elevation to the bottom of the lowest superstructure member. The design high water elevation needs to be established for each conceptual alternative. For the purposes of determining bridge clearances and openings the design high water will be the expected water elevation resulting from a 75 year recurrence interval (4,000 cfs flow). This reduction does not account for any clearance requirements that may be imposed by the South Florida Water Management District (SFWMD). The bridge drift clearance will be reevaluated for the recommended design alternative prior to final approval. The expected water velocity and the potential for debris impacting the superstructure will be part of the evaluation of the recommended design. If the clearance can be reasonably increased, up to the desirable clearance, with minimal economic and/or environmental impacts, you may be asked to review the design to provide increased clearance.

Since bridge drift clearance standards must be approved in this case by both the Department and the SFWMD, we recommend you contact SFWMD for their opinion. For preliminary considerations, as long as the velocity in the canal during the maximum design flow event at the proposed bridge location is at or under 2.5 feet per second (fps), and the type of floating debris does not cause damage to the lowest member elevation of the bridge structure, then the request may be considered for a waiver by the Department. It should also be noted, however, that the other vertical clearance which must be met is the six-foot navigation vertical clearance necessary for maintenance of the canal and the bridge structure. This six-foot vertical clearance should be above the normal water surface elevation, or the October ground water elevation.

Please reference the enclosed typical section demonstrating bridge drift clearance.

5) Request by the Corps that the Department accept overtopping of Tamiami Trail during a 1 in 500-year flow event:

Based on the design high water elevation provided by the Corps of 9.5 feet NGVD (derived from the occasional 4,000 cfs flow), a minimum profile grade elevation at the roadway crown of 12 feet would be required.

3) Request by the Corps to use black base at a one-foot thickness instead of lime rock at a two-foot thickness) as a subgrade material in alternatives developed for Tamiami Trail:
As we discussed in the February 23rd meeting, the use of black base is acceptable, although typically more expensive than lime rock. The pavement design above is based on the use of black base and a one-foot clearance from its bottom to the design high water elevation.

4) Waiver request by the Corps to reduce the two-foot bridge drift clearance to a one-foot bridge drift clearance:
We concur in the reduction of the bridge drift clearance from two feet to one foot for purposes of conceptual alternative development. This clearance will be measured from the design high water elevation to the bottom of the lowest superstructure member. The design high water elevation needs to be established for each conceptual alternative. For the purposes of determining bridge clearances and openings the design high water will be the expected water elevation resulting from a 75 year recurrence interval (4,000 cfs flow). This reduction does not account for any clearance requirements that may be imposed by the South Florida Water Management District (SFWMD). The bridge drift clearance will be reevaluated for the recommended design alternative prior to final approval. The expected water velocity and the potential for debris impacting the superstructure will be part of the evaluation of the recommended design. If the clearance can be reasonably increased, up to the desirable clearance, with minimal economic and/or environmental impacts, you may be asked to review the design to provide increased clearance.

Since bridge drift clearance standards must be approved in this case by both the Department and the SFWMD, we recommend you contact SFWMD for their opinion. For preliminary considerations, as long as the velocity in the canal during the maximum design flow event at the proposed bridge location is at or under 2.5 feet per second (fps), and the type of floating debris does not cause damage to the lowest member elevation of the bridge structure, then the request may be considered for a waiver by the Department. It should also be noted, however, that the other vertical clearance which must be met is the six-foot navigation vertical clearance necessary for maintenance of the canal and the bridge structure. This six-foot vertical clearance should be above the normal water surface elevation, or the October ground water elevation.

Please reference the enclosed typical section demonstrating bridge drift clearance.

5) Request by the Corps that the Department accept overtopping of Tamiami Trail during a 1 in 500-year flow event:

Overtopping of Tamiami Trail is allowable in extreme events. Our design standards require that the cross drains (bridges and culverts) accommodate the flows expected on a 75 year recurrence interval (4,000 cfs flow). For each design alternative developed, please identify the recurrence interval that will result in an encroachment of water onto the travel lanes of the highway, and the expected duration of the encroachment.

Responses to additional questions in your letter are provided below:

6) Environmental requirements which would need to be considered in the development of the plan for modification of Tamiami Trail:

At a minimum, all standard NEPA requirements should be included in the alternatives evaluation. This includes the following:

a) Social Impacts
1. Land Use Changes
2. Relocation Potential (including business sign relocations and other impacts to adjacent business)
3. Community Services
4. Title VI Considerations
5. Controversy Potential
6. Utilities

b) Cultural Impacts
1. Section 4(f) Lands
2. Historic Sites
3. Archaeological Sites

c) Natural Environment
1. Wetlands (direct and secondary impacts and benefits)
2. Water Quality (direct and secondary impacts and benefits)
3. Floodplains
4. Wildlife and Habitat (direct and secondary impacts and benefits)
5. Farmlands

d) Physical Impacts
1. Noise
2. Air
3. Construction
4. Contamination
5. Navigation

Endangered Species; Wetlands Assessment:

A full Endangered Species survey is needed, including a survey for endangered and threatened plants by a qualified botanist trained to recognize and identify such plants, and one survey for endangered fauna. While it is understood that the USFWS's Biological Opinion has recommended this project as potential enhancement for the endangered Cape Sable Seaside sparrow, this project has the potential to affect other species. A systematic endangered species survey and evaluation for each NEPA alternative will be needed in order to coordinate the preferred design with the USFWS under ESA Section Seven consultation. This analysis should include both temporary impacts (from MOT, construction noise disrupting nesting birds, etc.) and permanent impacts, as well as direct (within the project footprint) and secondary (outside the project footprint) impacts. A similar analysis is needed to assess the amount of wetland impacts resulting from this project. Again, while it is recognized that this project is expected to enhance wetlands beyond the project area, direct wetlands impacts from this project could be substantial. A systematic field evaluation of the acreage, type and condition of all temporary and permanent wetlands impacts, as well as an analysis of the type, amount and present condition of wetlands to be enhanced as a result of the project, will be needed. This will insure a systematic comparison so that no net loss of wetlands occurs, in accordance with Presidential Executive Order 11990 dated May 23, 1977. It will also insure that any needed mitigation can be planned for as early as possible. The wetlands assessment will also provide important information which will be needed in the evaluation of project impacts to endangered and threatened species within, or migrating through, the area.

Contamination Assessment:
A Phase I contamination impact assessment which considers adjacent properties should be performed as part of the alternative analysis process, however it does not appear from a cursory review of the project area that the potential exists for substantial contamination impacts. Any contaminated soil disrupted by roadway construction must not be exacerbated and must be remediated during construction by a qualified contamination remediation contractor. TSP's for handling this material should be included in the construction contract documents prior to contract letting.

Public Involvement; Canal and Adjacent Property Access Issues:
A Public Involvement Plan which identifies all potentially affected parties, including affected property owners and those who access the area for recreational purposes, as well as the motoring public, is suggested. There is potential to affect recreational access usage of Canal L-29, and adjacent property access, either through elevation of Tamiami Trail, or the possible need to construct retaining walls (see water quality discussion below) or relocate guardrail. Any changes in recreational access will need to be coordinated with the SFWMD and the public. In addition, any access changes which affect the SFWMD's ability to perform either routine or emergency (post-hurricane) maintenance of Canal L-29 will need to be coordinated with the SFWMD's Maintenance Division. Access to adjacent properties may be affected if the roadway is elevated, or if retaining walls must be built due to right-of-way restrictions. At a minimum, this would require easements to perform driveway harmonization during construction, and may require

right-of-way acquisition (see water quality discussion below).

Cultural Resource Assessment:
As mentioned above, a detailed archaeological and historical survey should be made by a qualified firm approved by the SHPO, and the results of the survey coordinated and addressed with the SHPO.

Permits:
Permits which need to be obtained, at a minimum, include federal and state dredge and fill permits from the appropriate agencies, a Department of Transportation permit authorizing the roadway modifications, and a SFWMD Right-of-Way Occupancy permit for any permanent or temporary impacts to their right-of-way. Other permits, such as the DERM Class II (drainage system) or state issued (Florida Department of Environmental Protection [FDEP] or SFWMD) drainage permit may be needed.

Utilities:
We are aware of at least one buried telephone fiber optic line adjacent to Tamiami Trail within our right-of-way. If the roadway is elevated on the same footprint as the existing facility, it will probably not be necessary for the utility to relocate this line. However, construction of MOT facilities (e.g., temporary roads), or construction of culverts or bridges under the roadway have the potential to affect this line. Other utilities may be within or adjacent to the right-of-way. A full investigation of all utilities in the area must be performed as required by Florida Statutes, and impacts coordinated with the utility companies and the Department. If needed, the Department can assist you with information on which utility companies you should contact.

As mentioned above in the General Comments, the above list of environmental concerns should not be considered all-inclusive. Once the proposed improvements (elevation, bridges, culverts, etc.) have been established, additional project scoping and a complete field review should be performed in order to determine all environmental considerations for this project.

7) Water quality / drainage requirements which would need to be considered in the development of the plan for modification of Tamiami Trail:
Drainage must be provided for in the reconstruction of this portion of Tamiami Trail. The drainage facilities should be designed based on a three-year design storm frequency to convey the water. From the water quality standpoint, this facility should be designed based on a five-year design storm frequency, zone 10 or the equivalent 10-year storm frequency curves of Miami-Dade County. Pollution control structures must be designed accordingly prior to an overflow discharge. Two types of different systems might be utilized for this facility. The first is drainage swales with rock trenches at the bottom of the swales working as french drains, and the second is a french drain system where applicable. Since this road carries a rural

classification, roadside swales would be preferable and less expensive. However if right-of-way constraints, such as the need to avoid impact to Everglades National Park, or restraints on the north side of the roadway adjacent to the canal, result in inadequate right-of-way to meet the requirements of the 8 foot shoulder and roadside swales, some other drainage system will have to be designed. Drainage systems such as collection and piping of stormwater to swale areas, or the installation of french drains, will add to project costs. Additional right-of-way may be needed to accommodate the drainage system, which will also add to cost and could substantially affect the project schedule. For these reasons, drainage requirements should be addressed as early as possible.

Treatment requirements are, of course, set by the applicable regulatory agency. The Department typically obtains its drainage permits from Miami-Dade County's Department of Environmental Resources Management (DERM) under its state-delegated program, except in the case of large projects (over 40 acres of impervious area), in which case a drainage permit is obtained from the SFWMD. Typically we are required to provide treatment for the first one inch of roadway runoff. Specific water quality treatment requirements for this project would be set by the appropriate permitting agency (the FDEP, SFWMD or DERM).

8) Maps showing the Department's right-of-way for Tamiami Trail between Krome Avenue and water control structure S-333:
Copies of FDOT right-of- way maps for this portion of Tamiami Trail are enclosed. If you have any question regarding these maps please contact Arturo Toriac of our Right-of-Way Engineering Office at (305) 470-5195.

9) Status update on the resolution of ownership on some portion(s) of Tamiami Trail between the Department and the SFWMD:
The Department has received Tamiami Trail right-of-way maps, deeds and other documents from the SFWMD, and is presently comparing them with Department right-of-way maintenance maps to identify conflict areas. Mrs. Betty Blackman of the SFWMD has indicated that once the Department defines its corridor and determines the extent of the conflict areas, the SFWMD will consider the appropriate resolution of this issue. We are working steadily on this issue and hope to resolve it within the next two to three months. We will notify you when it is resolved or, alternatively, keep you informed of our progress.

In addition to the information presented here, the Corps should contact our Maps and Publications Office in Tallahassee at (850) 414-4915 for copies of several Department manuals which should be utilized in developing this project. These include the Project Development and Environment Manual, the Drainage Manual, the Plans Preparation Manual, the Roadway and Traffic Design Standards Manual.

I hope this information is informative and helpful. It is emphasized that all environmental and engineering considerations should be studied thoroughly and weighed early in the process, prior to completion of the NEPA document, and not during a later detailed design phase, since many of the above listed items have the potential to affect the selected NEPA alternative. This will prevent serious delays later in the process as final design plans are developed.

We would like to request that the Corps provide as soon as possible a detailed written project schedule which includes all milestone activities (hydrologic modeling, alternatives analysis, interagency coordination, public involvement, document preparation and approval, final design, construction, etc.).

If you have any questions regarding the enclosed information, please call me at (305) 470-5220. We look forward to continuing to work with you on this very important project.

Sincerely,

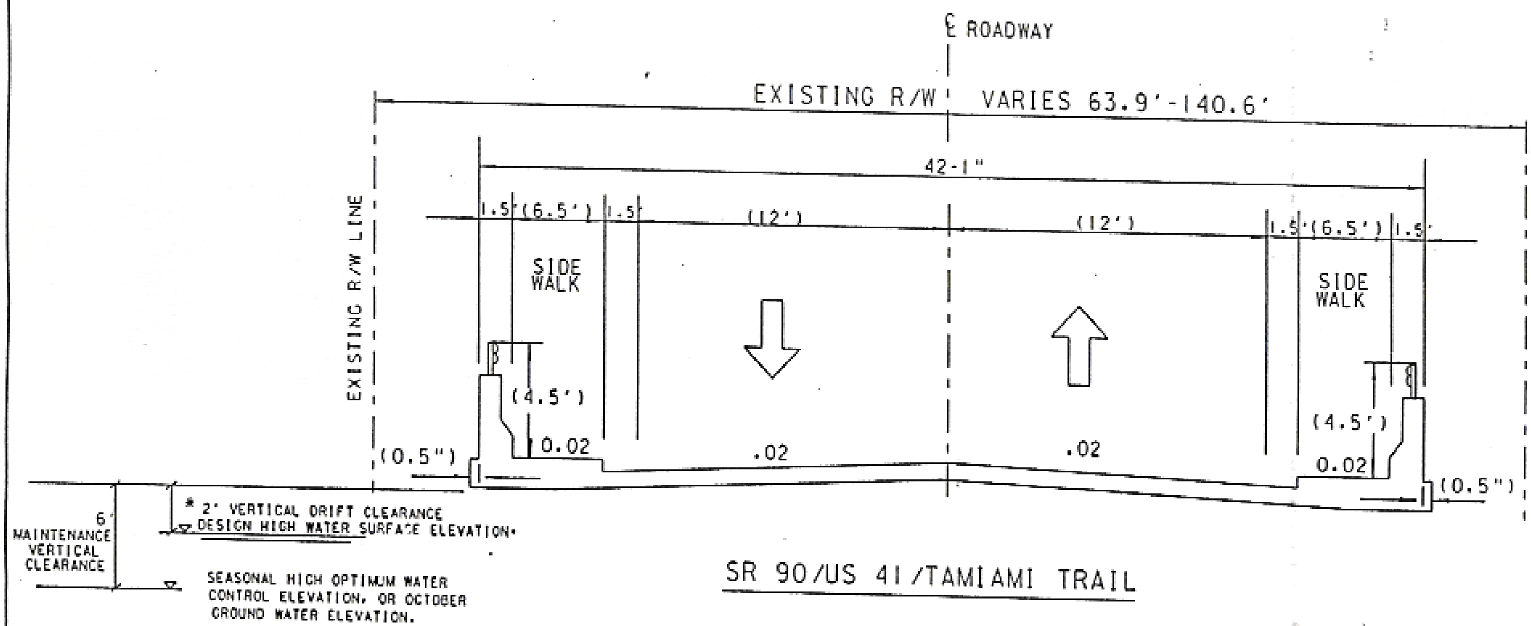
Barbara Bernier Culhane, A.I.C.P.
District Environmental Administrator

cc: Joe Miller, ACOE Jacksonville, District Engineer
Leroy Irwin, FDOT Tallahassee, Manager, Central Environmental Management Office
Jose Abreu, FDOT Miami, District Secretary
John Martinez, FDOT Miami, District Director of Production
Mike Ciscar, FDOT Miami, District Environmental Management Engineer

Florida Department of Transportation
Coordination Team Members
for the U.S. Army Corps of Engineers
Modified Water Deliveries Project / Tamiami Trail Modifications

Name/Title	Address	Phone	Fax
Barbara Culhane, A.I.C.P., District Environmental Administrator FDOT Project Coordinator	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6101 Miami, Florida 33172	(305) 470-5220	(305) 499-2308
Marjorie Bixby, Environmental Manager environmental impact review; National Environmental Policy Act (NEPA) document review; project coordination documentation.	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6101 Miami, Florida 33172	(305) 470-5229	(305) 499-2308
Jorge Frases, P.E., Senior Project Manager roadway design issues; Project Development issues; typical section, traffic safety and Level of Service issues.	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6103 Miami, Florida 33172	(305) 470-5305	(305) 470-5205
Ricardo Salazar, P.E. District Drainage Engineer storm water treatment issues; roadway elevation issues.	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6218 Miami, Florida 33172	(305) 470-5264	(305) 470-5293
Reinaldo Carvajal, P.E. Drainage Engineer storm water treatment issues; roadway elevation issues; hydrology issues.	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6218 Miami, Florida 33172	(305) 470-5251	(305) 470-5293
Roberto Perez, P.E. Pavement Design Engineer roadway and pavement design issues.	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6111 Miami, Florida 33172	(305) 470-5266	(305) 470-5338

Melanie Calvo, District Permits Coordinator regulatory permitting issues; wetlands impact issues.	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6101 Miami, Florida 33172	(305) 470-5223	(305) 499-2308
Susan Day, Assistant Right-of-Way Manager right-of-way acquisition; right-of-way impact issues.	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6118 Miami, Florida 33172	(305) 470-5169	(305) 470-5564
James McGetrick, P.E. District Utilities Engineer utility issues.	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6218 Miami, Florida 33172	(305) 470-5231	(305) 470-5293
Charles Newton, District Traffic Maintenance Engineer Maintenance Of Traffic (MOT) issues.	Florida Department of Transportation District Six 1000 N.W. 111 Avenue, Room 6202 Miami, Florida 33172	(305) 470-5344	(305) 470-5815
Mikhail Dubrovsky, P.E. Construction Plans Review Engineer constructibility issues.	Florida Department of Transportation District Six Construction Office 1000 N.W. 111 Avenue Miami, Florida 33172	(305) 499-2354	(305) 499-2351
Robert Crim, P.E., State Project Development Engineer Central Office project coordinator; Project Development issues; design issues.	Florida Department of Transportation Central Environmental Mgmt. Office 2740 Centerview Drive, Suite 3C Tallahassee, Florida 32399-2100	(850) 487-3985	(850) 922-7217
David Miro, P.E. Districts Four and Six Geotechnical Engineer geotechnical issues.	Florida Department of Transportation District Materials Office 14200 West S.R. 84 Davie, Florida 33325	(954) 475-4102	(954) 475-4119



*VERTICAL DRIFT CLEARANCE MAY BE REDUCED TO 1' IF S.F.W.M.D. AGREES WITH THIS WAIVER REQUEST.

SR 90 - US 41 - TAMIAMI TRAIL

FIGURE NO. 1

FLEXIBLE PAVEMENT DESIGN SUMMARY SHEET

Preliminary , subject to change

Prepared by: Roberto Perez	Date: May 6, 1999
W.P.I. No.	SR/90/US41/Tamiami Trial
State Project No. 87110-	From 11 miles w of SR 997
F.A.P. No.	To SR 997/Krome Ave
County Miami-Dade	Project Length 11 miles
Opening Year 2002	LBR 40 SSV ---
Design Year 2022	Mr 84 Mpa
80 KN/eq.Loads 3,100,000	%Reliability 90
SN Required 3.45	Design Speed 55 MPH

Type of Work and location: **Reconstruction (Existing Profile varies from 10.3 to 12.0 Ft NGVD, Prop. Profile will be at 12.0 Ft NGVD**

Existing Pavement:

	Tk.	Coef.	SN
Sub-grade Stabilization (LBR 40)	12"	0.08	0.96
Limerock Base 12" tk.	12"	0.18	2.16
Type S Asphaltic Conc. 3.5" tk	3.5"	0.25	0.87
FC-2, Friction Course 5/8"tk	5/8"	0.00	0.00
			3.99

Prop. Profile Grade :

9.50 (DHW)+1ft Clearence+1.5 ft(Pav't tk.+cross slope=12.0 Ft NGVD
It means raise the Road from 0 to (12.0-10.3) 1.7 Ft= 20.4 inches

Prop. Pavement:

Mill FC-2, entire corridor

		SN
Existing pavement SN		3.99
Type S overbuild(4" to 12.4")(400 to 1240 lb/sy)		0.00
OBG 9 *		1.80
Type `SP' Struct.Cse.(Level 3)2" tk	0.44	0.88
FC5-Friction Course,(80lb/sy),3/4"tk	0.00	0.00
	Design SN	**6.67**

*Optional code permite 609 (6"ABC-3)

Approved by: [signature]
Pav.Des.Eng Date : 5-6-99

Concurred By: [signature]
Dist.Des.Eng. Date: 5-6-99

Sheet 1 of 1

APP. B

APPENDIX B HYDROLOGY AND HYDRAULICS

Appendix B-1 COE Analysis of Tamiami Trail

1. Introduction. This interim report has been prepared to investigate and document potential high water conditions along U.S. Highway 41 (U.S. 41) also known as Tamiami Trail caused by construction and operation of the Modified Water Deliveries to Everglades National Park project and Comprehensive Everglades Restoration Project.

2. Authorizations and Background. Water regulation in the Everglades and Everglades National Park (ENP) are part of the larger Central and Southern Florida project (C&SF). Phase I of the Comprehensive Plan for the C&SF Project was authorized in 1948, as outlined in House Document No. 643, The remainder of the Comprehensive Plan was authorized by the Flood Control Act of 1954. A C&SF map is attached as Figure 1. The project purposes include flood control, prevention of salt water intrusion, water supply to ENP, municipal and agricultural water supply, groundwater recharge, and preservation of fish and wildlife. Project features include Water Conservation Area (WCA) Nos. 1, 2, and 3. WCA No. 3 is the largest and southernmost of the three WCA's with a total area of about 915 square miles. It is subdivided into WCA No. 3A (760 square miles) and 3B (156 square miles) by Levee 67A and C (L-67A and C). WCA No. 3B is completely encircled by levees and is not regulated. The majority of inflow and outflow consists of direct rainfall, seepage, and evaporation and transpiration. There are some small culverts in L-29 at Coopertown. Water Deliveries to ENP, other that direct rainfall are provided from WCA No. 3A.

2.1 In 1962, construction of Levee 29 (L-29) was completed. This was the final feature of WCA No. 3A and enabled control of all flows into Shark River Slough in the northern portion of ENP. After 1962, all flows into the ENP via Shark River Slough were discharged at the S-12 structures.

2.2 L-67 Extension (L-67 Ext.) was authorized by the Flood Control Act of 1948 (PL-858; 80th Congress). Its purposes are: to convey water releases through the S-12 structures far enough into the Park to prevent increases in water levels on adjacent private lands above those experienced under prior conditions; and to prevent flooding of U.S. Highway 41. The L-67 Ext. borrow canal was constructed from May 1966 through April 1967 to aid in the implementation of the 1966 Interim Release Schedule for ENP that was agreed upon following a severe drought from 1962 through 1965. The L-67 Ext. borrow canal was designed to provide 1,000 cfs of water to the Park during relatively wet conditions (its conveyance during the dry season is considerably less).

2.3 The Flood Control Act of 1965 authorized a plan to provide seasonal flood protection in Southwest Dade County. The plan consisted of levees, canals, water control structures, and pumping stations capable of removing 15 inches of runoff per month plus seepage into the area following a 10-year flood. The approved plan provided for the southward and eastward continuation of the L-67 extension to connect with the L-31W levee at the western edge of the Frog Pond. The plan was designed to enable desirable water levels for winter agriculture in southwest Dade County. Growing recognition of the potential negative environmental impacts of the Southwest Dade project caused the local sponsor to withdraw their support for the project. This project was officially deauthorized after Congress expanded the ENP to include most of the area that would have been protected.

2.4 In 1968, the ENP-South Dade Conveyance System was authorized by Congress. It is designed to enable conveyance of flood waters to water supply needs and deliver water to the ENP's Taylor Slough and Canal 111 (eastern panhandle). The Conveyance System was superimposed over the existing flood control system. Design flood control and operation were not altered by the construction of these works.

2.5 On December 13, 1989, Congress passed Public Law 101-229, the Everglades National Park Protection and Expansion Act. This law authorizes modification to the Central and Southern Florida project to improve water deliveries to ENP. The purpose of the Act was to increase the level of protection of the outstanding values of Everglades National Park and to enhance and restore the ecological values, natural hydrologic conditions, and public enjoyment of such area by adding the area commonly known as Northeast Shark River Slough and the East Everglades to Everglades National Park; and assure that the Park is managed in order to maintain the natural abundance, diversity and ecological integrity of native lands and animals, as well as the behavior of native animals, as a part of their ecosystem. The Park was also expanded 107,000 acres to include portions of Northeast Shark River Slough (NESRS). In 1992, as directed by the Act, the U.S. Army Corps of Engineers published a General Design Memorandum for Modified Water Deliveries to Everglades National Park. The Modified Water Deliveries to Everglades National Park Project consists of structural and operational changes to the Central and Southern Florida Project in south Dade County. Specifically, water will be passed through WCA No. 3B into Northeast Shark River Slough through additional structures. Project components include reconnecting WCA No. 3A to 3B by structures through L-67A and gaps in L-67C, and reconnecting WCA No. 3B to Shark River Slough with structures in L-29.

2.6 Tamiami Trail (US 41) was completed in the late 1920's. As a source of borrow for Tamiami Trail and a means of conveying water in an east/west direction, the Tamiami Canal was constructed along the north side of the roadway. The original construction plans were not available for review. However, based on a consultants work on the western portion of Tamiami Trail, they estimate that the existing roadway pavement structure consists of a limerock base (10"-12" thick), an asphalt structural course (2"-3" thick), and an asphalt friction course (5/8"-1" thick). For this analysis, it is assumed that the subgrade extends 18" below the crown of the road.

3 Purpose of this Study. Due to proposed modifications of the Central and Southern Flordia (C&SF) Project, higher stages in WCA No. 3B and the L-29 borrow canal may potentially cause problems for U.S. Highway 41 (Tamiami Trail). This study was conducted to identify any potential impacts caused by implementation of the Modified Water Deliveries to Everglades National Park project and the Comprehensive Everglades Restoration Plan (CERP) to U.S Highway 41.

4. Future Conditions. The Modified Water Deliveries to Everglades National Park project includes the construction of several water control structures in this vicinity. With the construction of S-355A, S-355B, and S-356 and modification of S-333 the total discharge into the L-29 borrow canal would be a maximum of 4,000 cfs. The Comprehensive Everglades Restoration (CERP) (formerly the known as the C&SF Restudy) proposes further modifications to the C&SF project and flows could be higher than the 4,000 cfs proposed by the Modified Water Deliveries to ENP project. In addition these high flows are for long durations (weeks).

5. Study Plan. Hydrologic models were used to determine the stage and flow-paths in Everglades National Park for various flows. The South Florida Water Management Model (SFWMM) was used to establish boundary conditions for the two-dimensional RMA-2 model. The SFWMM model is a regional model which extends from Lake Okeechobee to Florida Bay. Water surfaces are computed on a 2 mile by 2 mile grid. The RMA-2 model was used for more detailed modeling in a limited area. Figure 2 shows RMA-2 model related features.. The north-south extent of the model extended from just south of Tamiami Trail to about 15 miles south of the southern terminus of L-67 Ext. The east-west extent extended from just west of L-67 Ext. to about L-31N and the 8 1/2 Square Mile Residential Area. The model boundary is also shown on Figure 3. The RMA-2 model constructed for this effort was calibrated against existing gage data in the area. A description of RMA-2 is found below.

6. Model Description. RMA-2 was developed by Resource Management Associates of Davis, California. RMA-2 is a two dimensional, depth averaged, free-surface, finite element program for solving hydrodynamic problems. RMA-2 can be used to compute water surface elevations and flow velocities at nodes; points in a finite element mesh representing a body of water such as a rivers, harbor, or estuary. RMA-2 can perform both steady-state and transient solutions. In other words, the boundary conditions (incoming flowrate, water surface elevation) can vary with time and a solution can be found at a number of time steps. This makes it possible to model dynamic flow conditions caused by fluctuating runoff or tidal cycles. RMA-2 is not applicable to supercritical flow problems. The output from RMA-2 is written to a binary solution file. The file

may contain the solution for one or more time steps depending on whether a steady-state or transient analysis is performed. The solution file can be input to SMS (Surface-Water Modeling System) for graphical display of the results. SMS is a pre- and post-processor for a two-dimensional finite element model and is specifically designed to be used in conjunction with the TABS-MD suite of programs maintained by the U.S. Army Corps of Engineers Waterways Experiment Station (WES). The TABS-MD programs will calculate water surface elevations and flow velocities for shallow water flow problems.

7. Existing Conditions. There are a numerous structures, levees, canals, and roads that influence stages and flow paths into and within ENP. (Note: all elevations herein reference the National Geodetic Vertical Datum of 1929 (NGVD29)) These features are shown on Figure 2.

7.1 L-67 Extension (L-67 Ext.) extends from S-333 to approximately 11 miles due south. The levee crown ranges from elevation 13 to 15 ft. There is a borrow canal on the levee's west side from which the levee was constructed. Canal invert elevations range from about -11.0 to -3.0 ft. and canal top widths range from about 30 to 60 ft. See Figure 3 for structure and canal locations.

7.2. There are 19 sets of culverts under Tamiami Trail in the approximately 11 mile stretch of highway between S-333 and S-334. Each culvert set consists of one to four culverts with diameters ranging from 42-inches to 60-inches. Culvert invert elevations and lengths are typically about 4 ft. and 60 ft., respectively.

7.3 Centerline elevations for Tamiami Trail in this reach range from about 10.2 ft to 12.2 ft based on data provided by FDOT. The average centerline elevation is about 10.9 ft.

7.4 Topographic Data: Survey lines south of Tamiami Trail in the ENP were used to build the grid for the RMA-2 model. These transects (x,y,z) were obtained from a 1981 survey by the ENP. As-builts for the L-29 Borrow Canal enlargement August 1975 were also used in the model.

7.5. Culverts: Culvert data was furnished by FDOT. There are 19 sets of culverts under Tamiami Trail between FDOT stations 732+10.0 and 1298+5.0 (S-333 to S-334) with each group having between 1 & 4 barrels (55 total barrels).

8. Future Flow Conditions: The RMA-2 model described above was calibrated to known water surfaces and flow rates at gages. The RMA-2 model then was given a variety of flowrates to determine associated water levels.. Flow rates and downstream boundary conditions were obtained from the SFWMM 2X2 runs done for the Central and Southern Florida (C&SF) Restudy selected alternative Alt13DR. Table 1 contains the flows and downstream boundary conditions used in the RMA-2 models.

9. Model Results. Model results for the RMA-2 runs are shown in Table 2 below. Results are taken at the south side (ENP) side of Tamiami Trail. Water levels on the north side (L-29) will be higher due to the resistance (headloss) of the culverts to passing these higher flows. Table 2 also shows the expected L-29 Borrow Canal stage based on the rated capacity of the culverts.

10. Alternative Considered. For this analysis, four bridges were added to the existing Tamiami Trail to permit water to flow from L-29 Borrow Canal to Everglades National Park. The same nine flows were examined to determine the effects of adding additional conveyance area through Tamiami Trail. For each flow, the RMA-2 model was run to determine the stage south of Tamiami Trail and the corresponding stage in L-29 Borrow Canal. The four bridges were selected on the following subjective criteria: proximity to control structures (S-333. S355A&B, S-356); downstream obstructions (vegetation, airboat camps, etc); low areas in the road; and distribution along L-29 Borrow Canal.

11. Conclusion. Graphical representations of the flows with and without bridges are shown on Figures 4 and 5 The bridges greatly reduce the L-29 Borrow Canal stages for the expected high flows.

12. CERP Compatibility. As a final check of this analysis, the RMA-2 results were compared to the modeling done for the CERP. Stage duration curves and hydrographs for cells immediately south of Tamiami Trail were used in this comparison. The output from the CERP modeling is attached as Annex A. These graphs indicate RMA-2 model and CERP 2X2 model results compare favorably.

Table 1

Tamiami Trail Modeling
Boundary Condition at Cell 1724

Event	Flow (cfs)	Stage 2X2
1-yr	597	7.15
2-yr	1600	7.94
5-yr	2250	8.23
10-yr	2700	8.39
20-yr	3150	8.56*
50-yr	3770	8.68
100-yr	4270	8.78
200-yr	4800	8.88
500-yr	5550	9.01

* Estimated stage.

Note: All elevations are in feet referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).

Table 2

Tamiami Trail Modeling
Without Project

Event	Flow (cfs)	Stage South US 41 RMA-2	L-29 Canal Stage with Culverts Only (1)
1-yr	597	7.39	7.50
2-yr	1600	8.20	8.32
5-yr	2250	8.54	8.70
10-yr	2700	8.74	9.00
20-yr	3150	8.90	9.30
50-yr	3770	9.15	9.65
100-yr	4270	9.21	9.82
200-yr	4800	9.31	10.05
500-yr	5550	9.43	10.40 (2)

Note: All elevations are in feet referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).

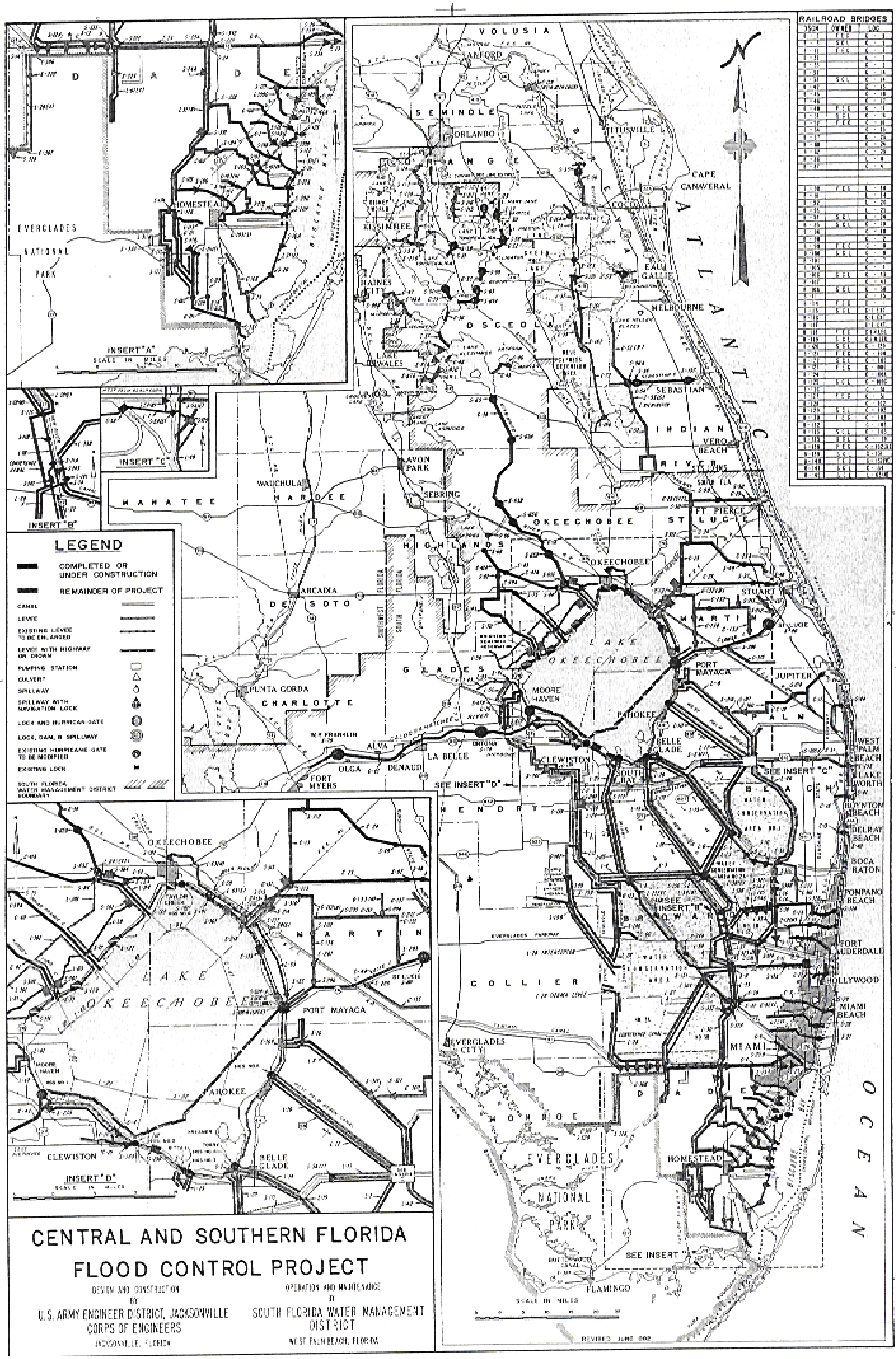
(1) Theoretical rating through the culverts
(2) Water will begin overtopping the road at approximate elevation 10.13 ft.

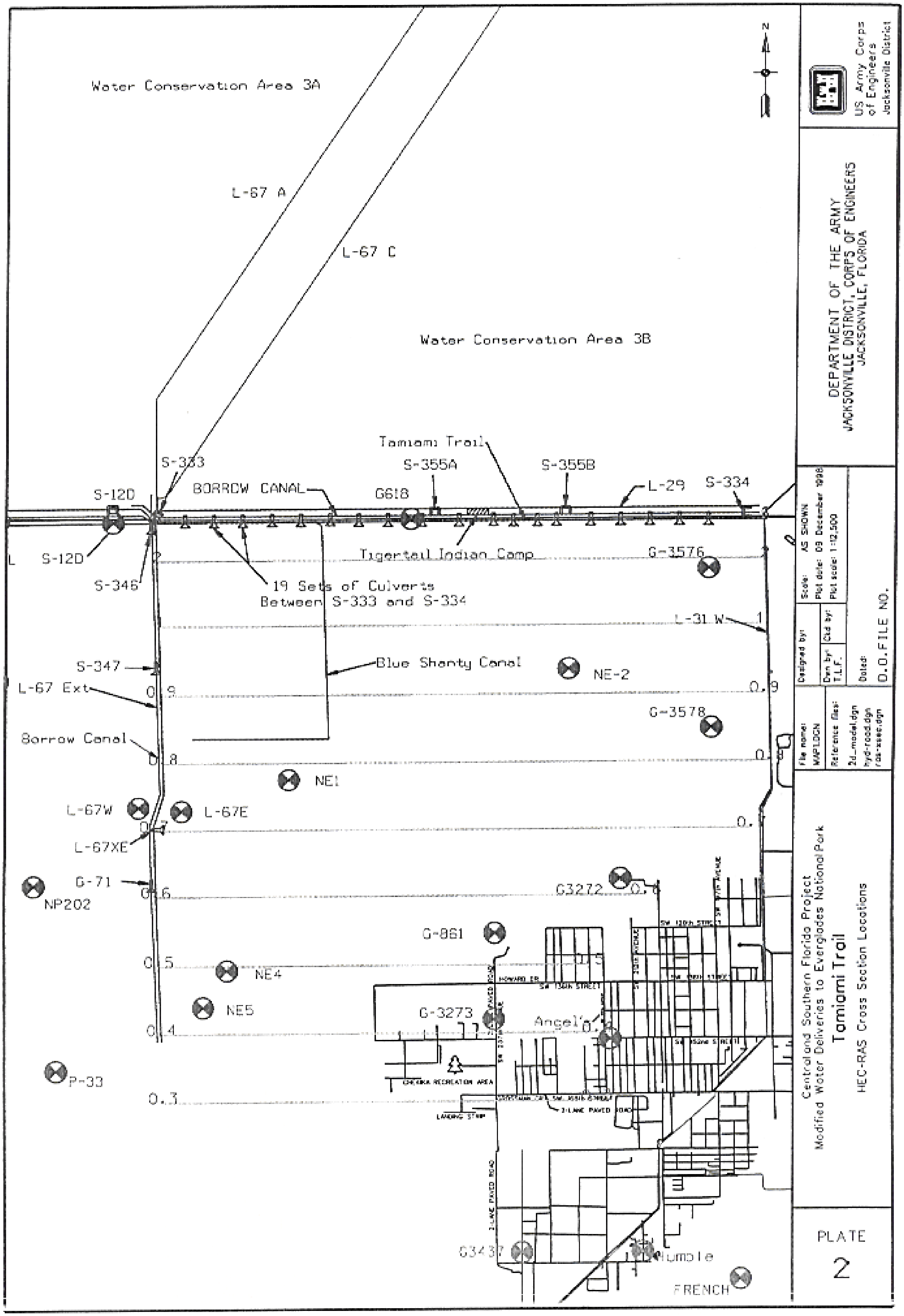
Table 3

Tamiami Trail Modeling
With Four Bridges

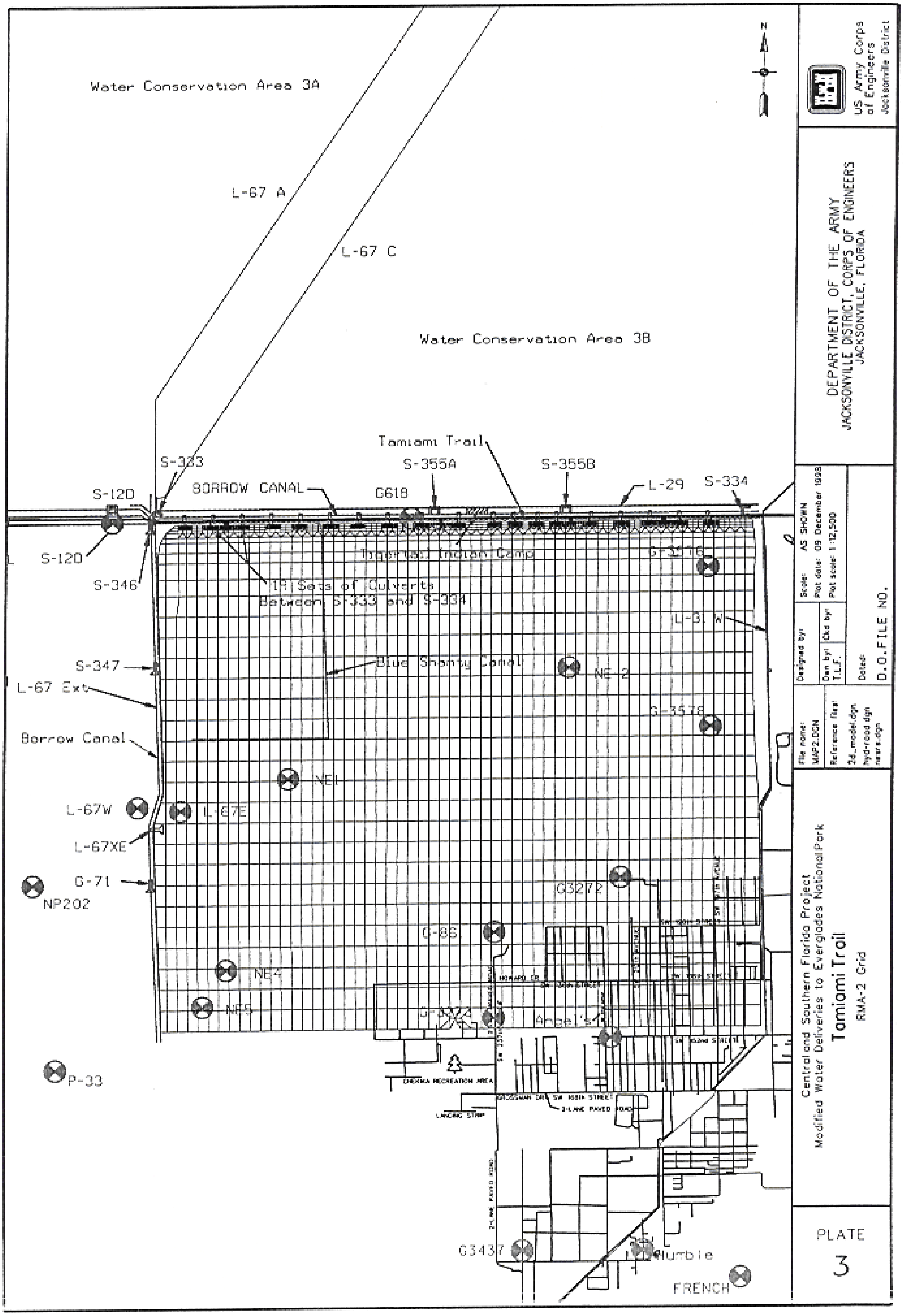
Event	Flow (cfs)	Stage South US 41 RMA-2	L-29 Canal Stage with Bridges
1-yr	597	7.39	7.39
2-yr	1600	8.20	8.20
5-yr	2250	8.54	8.55
10-yr	2700	8.74	8.75
20-yr	3150	8.90	8.93
50-yr	3770	9.15	9.23
100-yr	4270	9.21	9.30
200-yr	4800	9.31	9.36
500-yr	5550	9.43	9.58

Note: All elevations are in feet referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).


RAILROAD BRIDGES
LEGEND
COMPLETED OR UNDER CONSTRUCTION
REMAINDER OF PROJECT
INSERT "A"
INSERT "B"
INSERT "C"
INSERT "D"
SEE INSERT "C"
SEE INSERT "D"
VOLUSIA
SEMINOLE
ORANGE
OSCEOLA
INDIAN RIVER
OKEECHOBEE
ST LUCIE
MARTIN
HIGHLANDS
MANATEE
HARDEE
DE SOTO
GLADES
CHARLOTTE
HENDRY
COLLIER
DADE
MONROE
SANFORD
ORLANDO
KISSIMMEE
HAINES CITY
LAKE WALES
TITUSVILLE
CAPE CANAVERAL
COCOA
EAU GALLIE
MELBOURNE
SEBASTIAN
VERO BEACH
FT PIERCE
STUART
JUPITER
AVON PARK
SEBRING
WAUCHULA
ARCADIA
PUNTA GORDA
FORT MYERS
OLGA
ALVA
DENAUD
LA BELLE
MOORE HAVEN
CLEWISTON
PAHOKEE
BELLE GLADE
PORT MAYACA
LAKE OKEECHOBEE
WEST PALM BEACH
LAKE WORTH
BOYNTON BEACH
DELRAY BEACH
BOCA RATON
POMPANO BEACH
FORT LAUDERDALE
HOLLYWOOD
MIAMI BEACH
MIAMI
HOMESTEAD
EVERGLADES CITY
EVERGLADES NATIONAL PARK
FLAMINGO
ATLANTIC
OCEAN
SEE INSERT "A"
SCALE IN MILES
CENTRAL AND SOUTHERN FLORIDA
FLOOD CONTROL PROJECT
DESIGN AND CONSTRUCTION BY
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
OPERATION AND MAINTENANCE BY
SOUTH FLORIDA WATER MANAGEMENT DISTRICT
WEST PALM BEACH, FLORIDA



Water Conservation Area 3A
L-67 A
L-67 C
Water Conservation Area 3B
Tamiami Trail
S-333
S-355A
S-355B
L-29
S-334
S-12D
BORROW CANAL
G618
S-12D
Tigertail Indian Camp
G-3576
S-346
19 Sets of Culverts
Between S-333 and S-334
L-31 W
S-347
Blue Shanty Canal
NE-2
L-67 Ext
0.9
G-3578
Borrow Canal
0.8
NE1
L-67W
L-67E
0.7
L-67XE
G-71
0.6
G3272
NP202
G-861
0.5
NE4
NE5
G-3273
Angel's
0.4
P-33
0.3
CHEKIKA RECREATION AREA
LANDING STRIP
2-LANE PAVED ROAD
G3437
Humble
FRENCH
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
US Army Corps
of Engineers
Jacksonville District
Designed by:
Dwn by: T.L.F.
Ckd by:
Scale: AS SHOWN
Plot date: 09 December 1998
Plot scale: 1:12,500
Dated:
D.O. FILE NO.
File name: MAP1.DGN
Reference files: 2d_model.dgn hyd-road.dgn ras-xsee.dgn
Central and Southern Florida Project
Modified Water Deliveries to Everglades National Park
Tamiami Trail
HEC-RAS Cross Section Locations
PLATE
2



Water Conservation Area 3A
L-67 A
L-67 C
Water Conservation Area 3B
Tamiami Trail
S-333
S-355A
S-355B
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S-334
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G618
S-12D
S-346
Tigertail Indian Camp
(19) Sets of Culverts Between S-333 and S-334
L-31 W
S-347
L-67 Ext
Blue Shanty Canal
NE-2
G-3578
Borrow Canal
NE1
L-67W
L-67E
L-67XE
G-71
NP202
G3272
G-86
NE4
NE5
Angel's
CHEKIKA RECREATION AREA
LANDING STRIP
2-LANE PAVED ROAD
P-33
G3437
Humble
FRENCH
US Army Corps of Engineers
Jacksonville District
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
Scale: AS SHOWN
Plot date: 09 December 1998
Plot scale: 1:12,500
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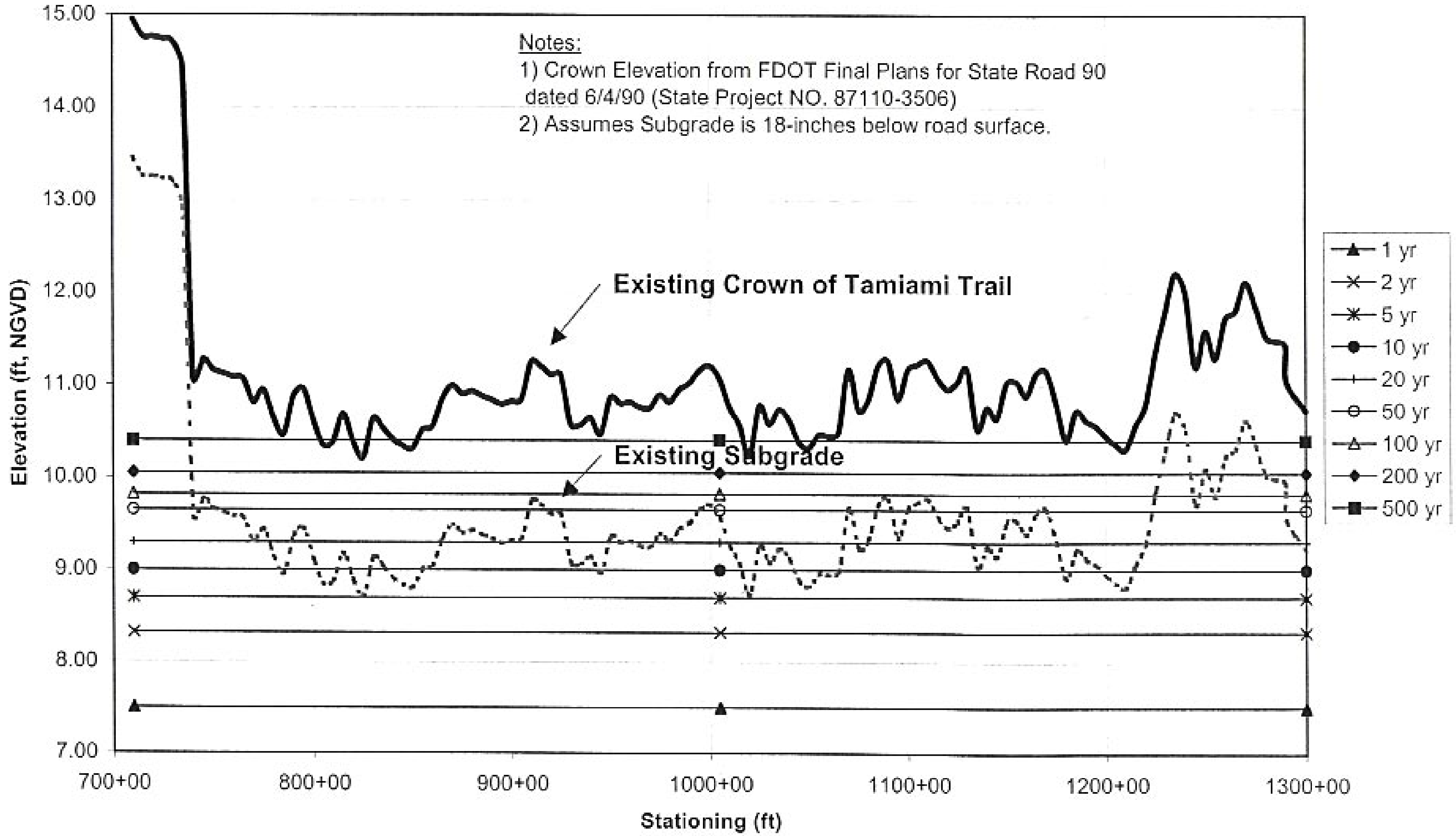
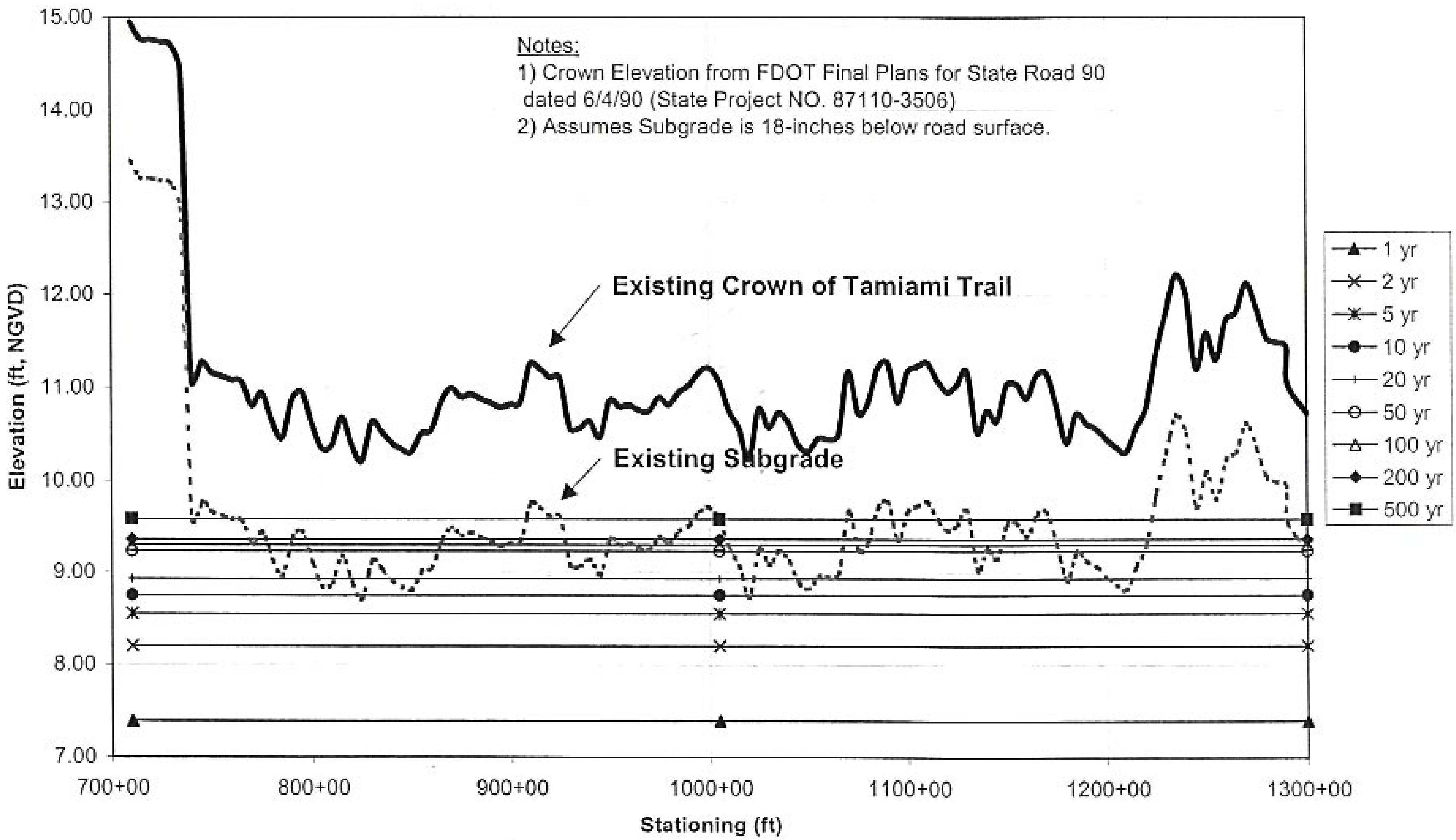
Ckd by:
Dated:
D.O. FILE NO.
File name: MAP2.DGN
Reference files:
Central and Southern Florida Project
Modified Water Deliveries to Everglades National Park
Tamiami Trail
RMA-2 Grid
PLATE
3

C&SF Comprehensive Review Plan (Restudy)
Existing Conditions
Water Surface Elevation L-29 Borrow Canal vs. Tamiami Trail Stationing



C&SF Comprehensive Review Plan (Restudy)
Proposed Alternative - Four Bridges
Water Surface Elevation L-29 Borrow Canal vs. Tamiami Trail Stationing



Appendix B-2 Stage Hydrographs and Duration Curves

Appendix B-2 Stage Hydrographs and Duration Curves

Post-it® Fax Note 7671	Date 11/2/00 | # of pages ▸ 5
To JACK SCHNEITLER	From M. JANSEN
Co./Dept. MIAMI TRANS PLAN	Co.
Phone #	Phone #
Fax #	Fax #

Christopher T Smith

11/02/2000 08:49 AM

To: rbingham@pbsj.com@exchange
cc:
Subject: L-29 Canal Data S333 & S334

Ralph -

Attached are data for L-29 canal as requested (ascii). S-333 tailwater is the western elevation and S-334 is the east elevation. You can interpolate between the reading to determine the stage at the boring locations.

Chris

---------------------- Forwarded by Christopher T Smith/CESAJ/SAJ02 on 11/02/2000 08:47 AM ---------------------------

Gregory A Stormant
11/02/2000 08:34 AM

To: Christopher T Smith/CESAJ/SAJ02@CESAJ
cc:
Subject: S333 & S334

As requested,

S333 Tailwater: June - July 2000

s333_tw.asc

S334 Headwater: June - July 2000

s334_hw.asc

Aaron

RECEIVED
TRANSPORTATION DESIGN
NOV 0 7 2000
PBS.J. INC.-WINTER PARK
R. Bingham
FILE

Water table from Ralph
Info.
11/3/00

Same cell
Should be an
average between 2

WEST

/E COAST CANALS/S333/ELEV-TAIL//1DAY//
RTS Ver:899 Prog:DSSMAT LW:02NOV00 07:32:06 Tag:T14295 Prec:0
Start: 31MAY2000 at 2400 hours; End: 01AUG2000 at 2400 hours; Number: 63
Units: FT-NGVD Type: INST-VAL

31MAY2000, 2400;	7.03
01JUN2000, 2400;	6.93
02JUN2000, 2400;	6.91
03JUN2000, 2400;	6.89
04JUN2000, 2400;	6.88
05JUN2000, 2400;	6.87
06JUN2000, 2400;	6.97
07JUN2000, 2400;	6.95
08JUN2000, 2400;	6.91
09JUN2000, 2400;	7.03
10JUN2000, 2400;	7.01
11JUN2000, 2400;	7.07
12JUN2000, 2400;	7.10
13JUN2000, 2400;	7.09
14JUN2000, 2400;	7.07
15JUN2000, 2400;	7.31
16JUN2000, 2400;	-901.00
17JUN2000, 2400;	-901.00
18JUN2000, 2400;	7.28
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20JUN2000, 2400;	7.29
21JUN2000, 2400;	7.29
22JUN2000, 2400;	7.15
23JUN2000, 2400;	7.15
24JUN2000, 2400;	7.24
25JUN2000, 2400;	7.20
26JUN2000, 2400;	7.25
27JUN2000, 2400;	7.28
28JUN2000, 2400;	7.21
29JUN2000, 2400;	7.20
30JUN2000, 2400;	7.19
01JUL2000, 2400;	7.18
02JUL2000, 2400;	7.19
03JUL2000, 2400;	7.25
04JUL2000, 2400;	7.25
05JUL2000, 2400;	7.26
06JUL2000, 2400;	7.27
07JUL2000, 2400;	7.35
08JUL2000, 2400;	7.29
09JUL2000, 2400;	7.30
10JUL2000, 2400;	7.33
11JUL2000, 2400;	7.32
12JUL2000, 2400;	7.32
13JUL2000, 2400;	7.30
14JUL2000, 2400;	7.29
15JUL2000, 2400;	7.30
16JUL2000, 2400;	7.28
17JUL2000, 2400;	7.17
18JUL2000, 2400;	7.11
19JUL2000, 2400;	7.07
20JUL2000, 2400;	7.07
21JUL2000, 2400;	7.13

22JUL2000, 2400;	7.16
23JUL2000, 2400;	7.17
24JUL2000, 2400;	7.18
25JUL2000, 2400;	7.12
26JUL2000, 2400;	7.09
27JUL2000, 2400;	7.06
28JUL2000, 2400;	7.03
29JUL2000, 2400;	7.04
30JUL2000, 2400;	7.03
31JUL2000, 2400;	6.99
01AUG2000, 2400;	6.99

END FILE

EAST

/E COAST CANALS/S334/ELEV-HEAD//1DAY//
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Units: FT-NGVD Type: INST-VAL

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02JUN2000, 2400;	7.14
03JUN2000, 2400;	7.10
04JUN2000, 2400;	7.09
05JUN2000, 2400;	7.07
06JUN2000, 2400;	7.11
07JUN2000, 2400;	7.13
08JUN2000, 2400;	7.14
09JUN2000, 2400;	7.21
10JUN2000, 2400;	7.19
11JUN2000, 2400;	7.24
12JUN2000, 2400;	7.29
13JUN2000, 2400;	7.27
14JUN2000, 2400;	7.26
15JUN2000, 2400;	7.47
16JUN2000, 2400;	-901.00
17JUN2000, 2400;	-901.00
18JUN2000, 2400;	7.47
19JUN2000, 2400;	7.48
20JUN2000, 2400;	7.49
21JUN2000, 2400;	7.47
22JUN2000, 2400;	7.36
23JUN2000, 2400;	7.35
24JUN2000, 2400;	7.38
25JUN2000, 2400;	7.39
26JUN2000, 2400;	7.43
27JUN2000, 2400;	7.44
28JUN2000, 2400;	7.40
29JUN2000, 2400;	7.41
30JUN2000, 2400;	7.38
01JUL2000, 2400;	7.38
02JUL2000, 2400;	7.45
03JUL2000, 2400;	7.44
04JUL2000, 2400;	7.46
05JUL2000, 2400;	7.45
06JUL2000, 2400;	7.45
07JUL2000, 2400;	7.53
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16JUL2000, 2400;	7.47
17JUL2000, 2400;	7.37
18JUL2000, 2400;	7.31
19JUL2000, 2400;	7.27
20JUL2000, 2400;	7.26
21JUL2000, 2400;	7.32

22JUL2000, 2400;	7.35
23JUL2000, 2400;	7.38
24JUL2000, 2400;	7.34
25JUL2000, 2400;	7.31
26JUL2000, 2400;	7.29
27JUL2000, 2400;	7.25
28JUL2000, 2400;	7.22
29JUL2000, 2400;	7.24
30JUL2000, 2400;	7.20
31JUL2000, 2400;	7.17
01AUG2000, 2400;	7.18

END FILE

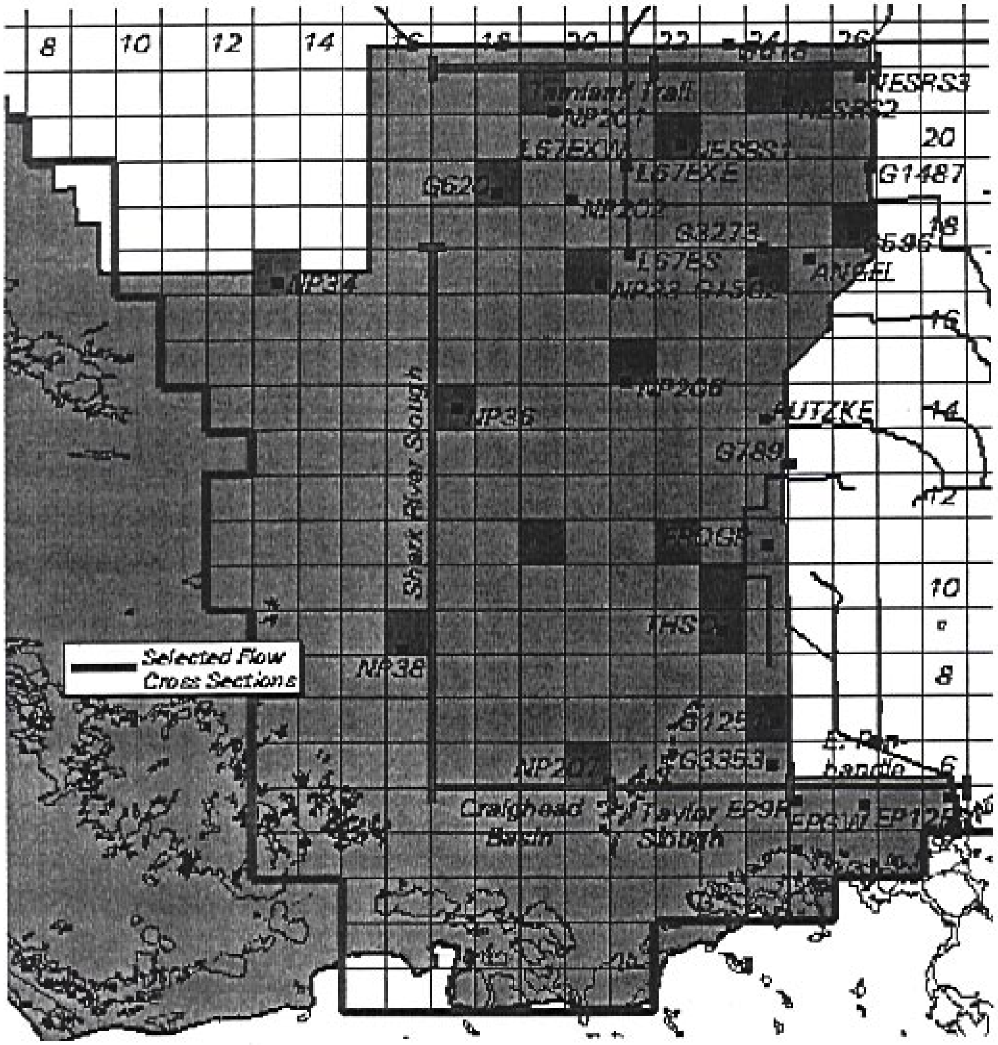
ANNEX A

CERP Model Results

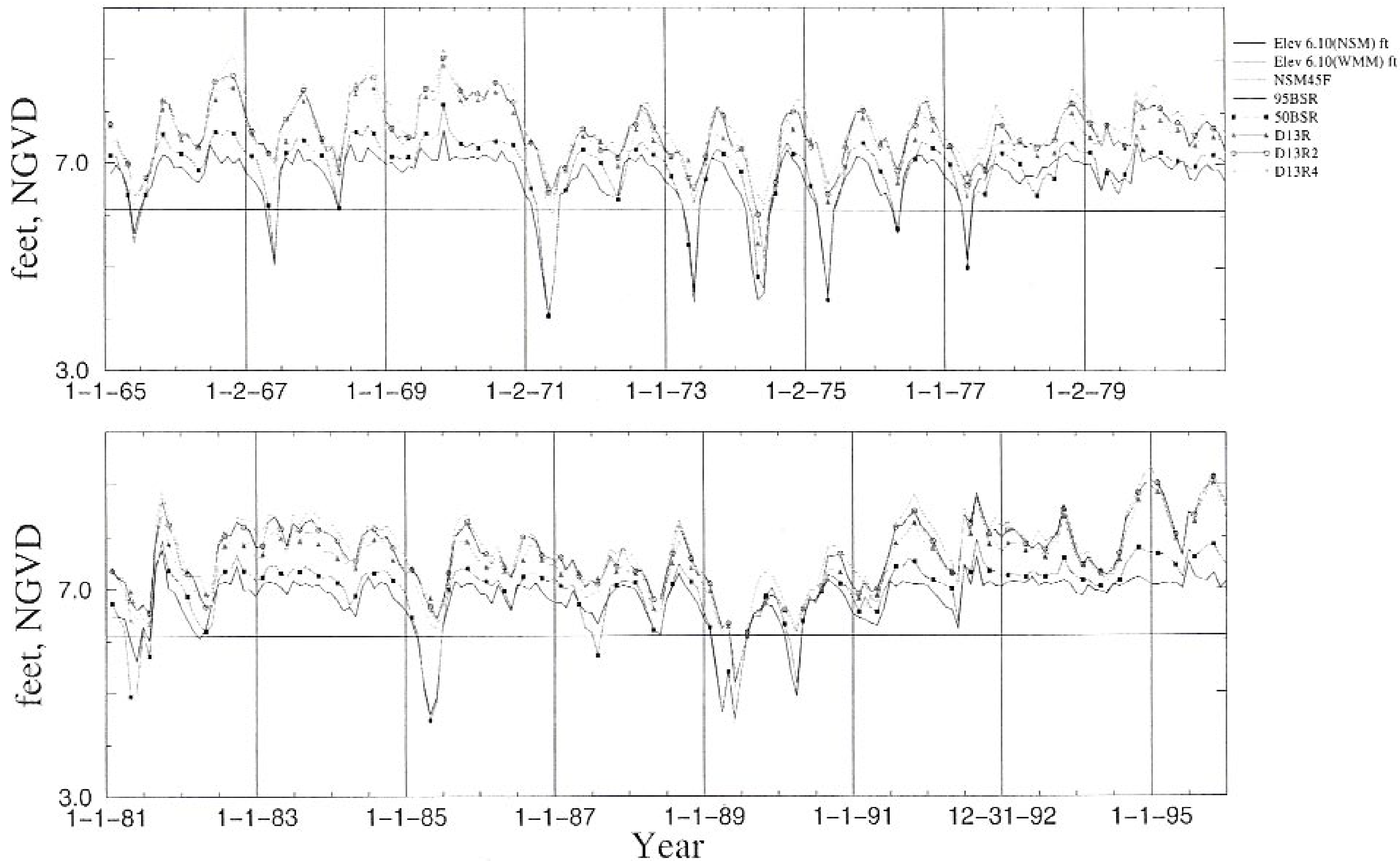
CENTRAL AND SOUTHERN FLORIDA PROJECT
COMPREHENSIVE REVIEW STUDY

FINAL
INTEGRATED FEASIBILITY REPORT AND
PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

April 1999

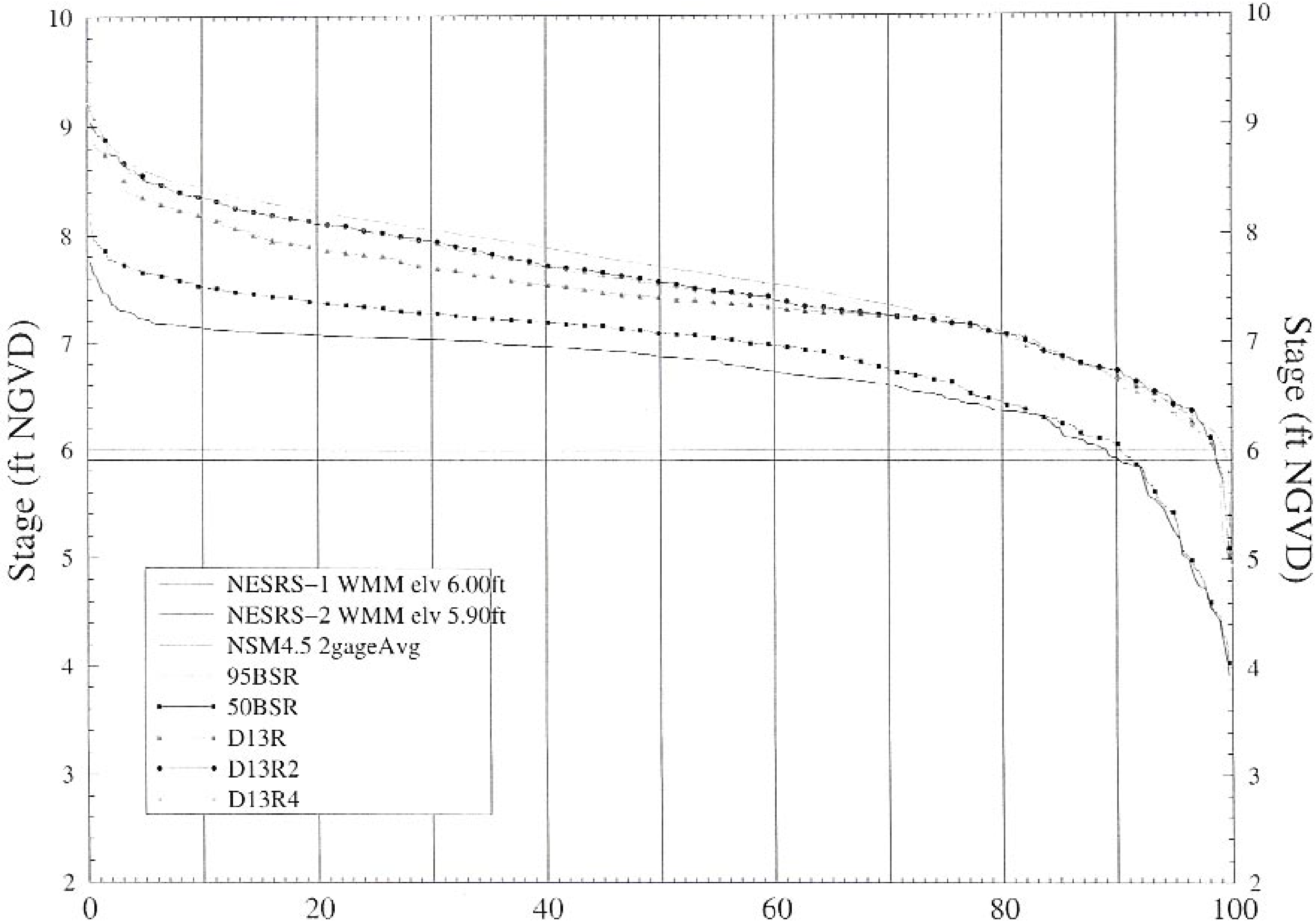

Selected Flow
Cross Sections
Tamiami Trail
Shark River Slough
Craighead Basin
Taylor Slough
NP201
L67EXW
L67EXE
NESRS1
NESRS2
NESRS3
G1487
G620
NP202
G3273
L67BS
ANGEL
NP34
NP206
NP36
RUTZKE
G789
THSO
NP38
G3353
NP207
EP9R
EP12R
8
10
12
14
18
20
22
24
26
16
6

Stage Hydrograph at N.E. Shark River Slough
Gage NESRS_2, Cell R21 C24



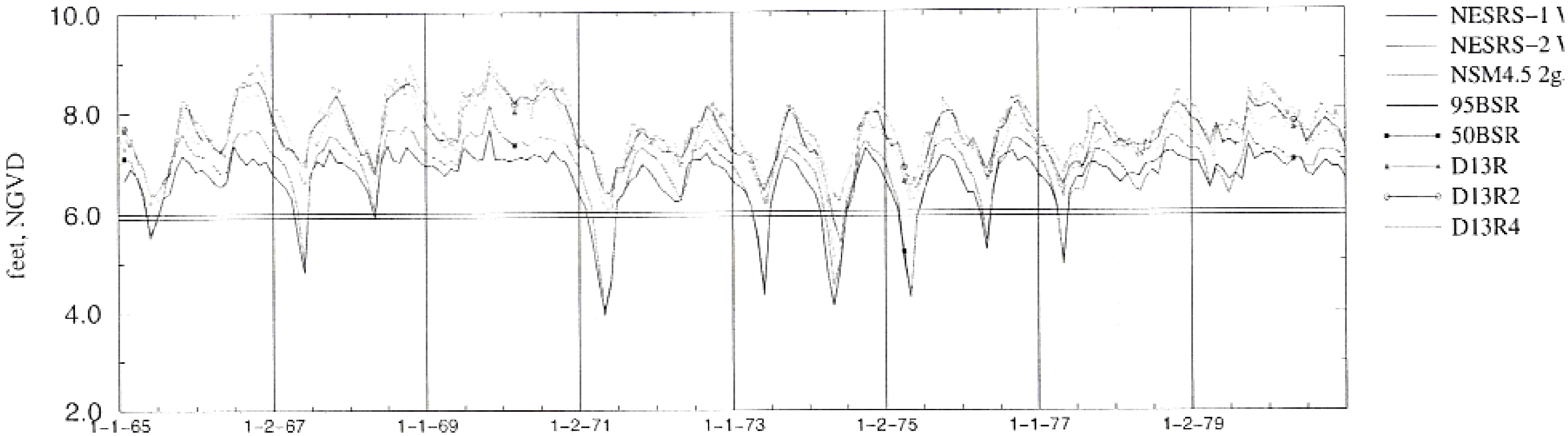
Run date: 01/14/99 09:23:17
For Planning Purposes Only
SFWMM V3.5

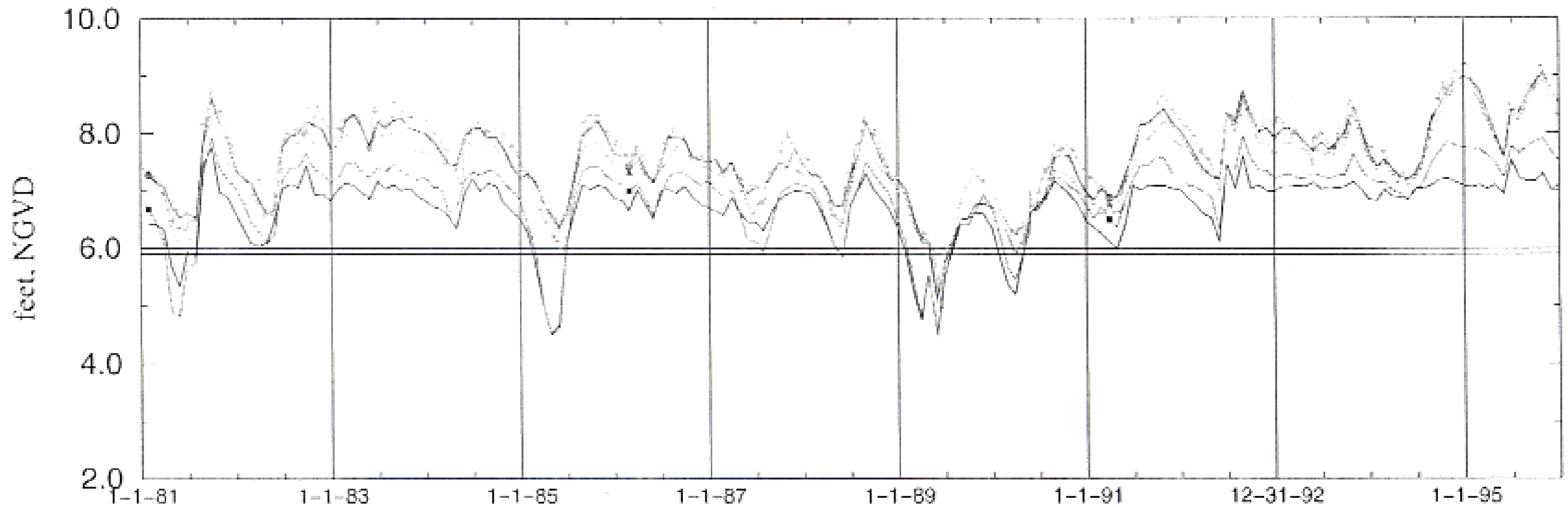
2–Gage Avg Import Stg Duration Curves for NESRS Gage NESRS–1(R20 C22) & NESRS–2(R21 C25)



Run date: 01/14/99 07:49:35
For Planning Purposes Only
SFWMM V3.5

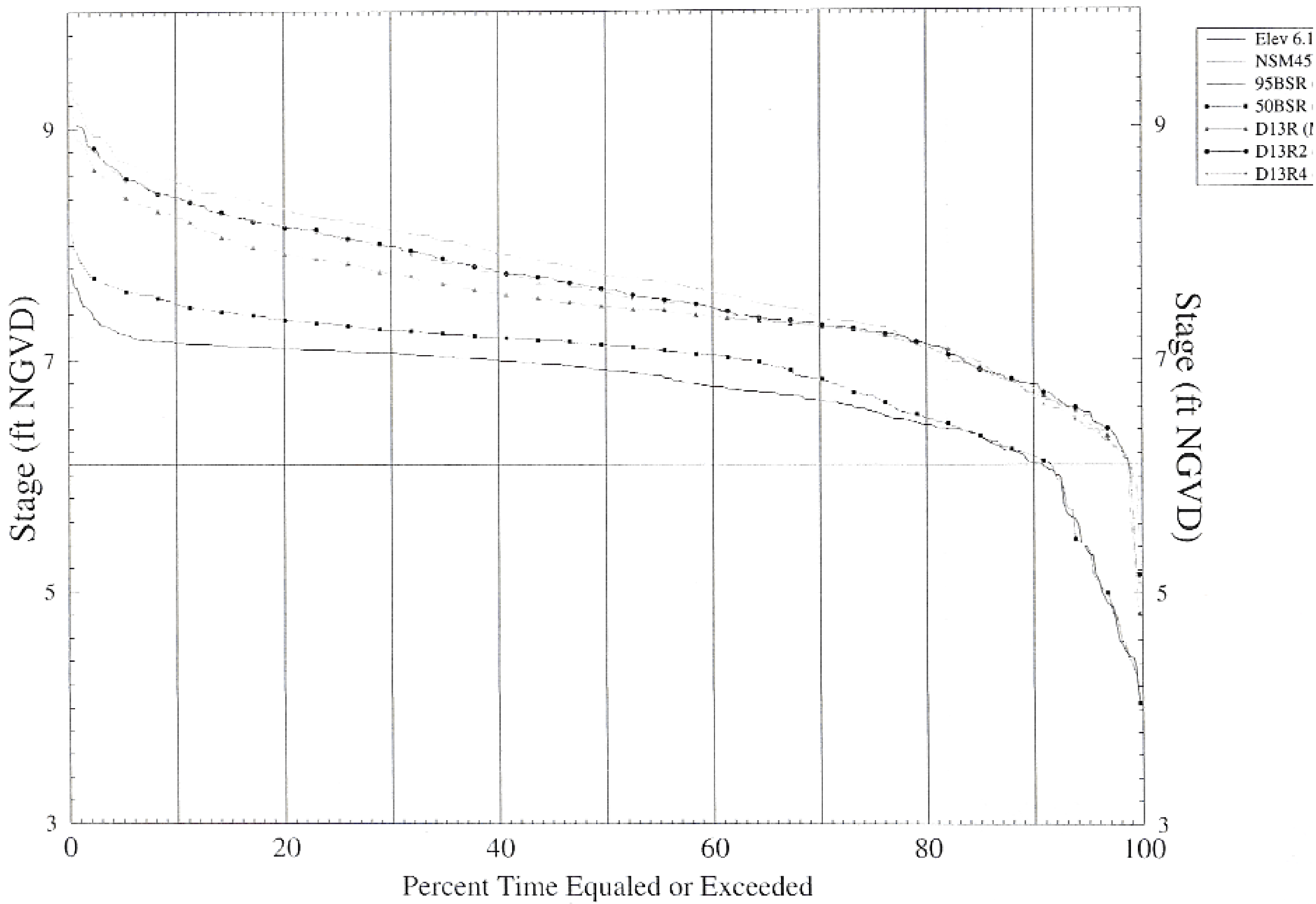
2–Gage Average Import Stage Hydrograph for NESRS
Gage NESRS–1(R20 C22) & NESRS–2(R21 C25)





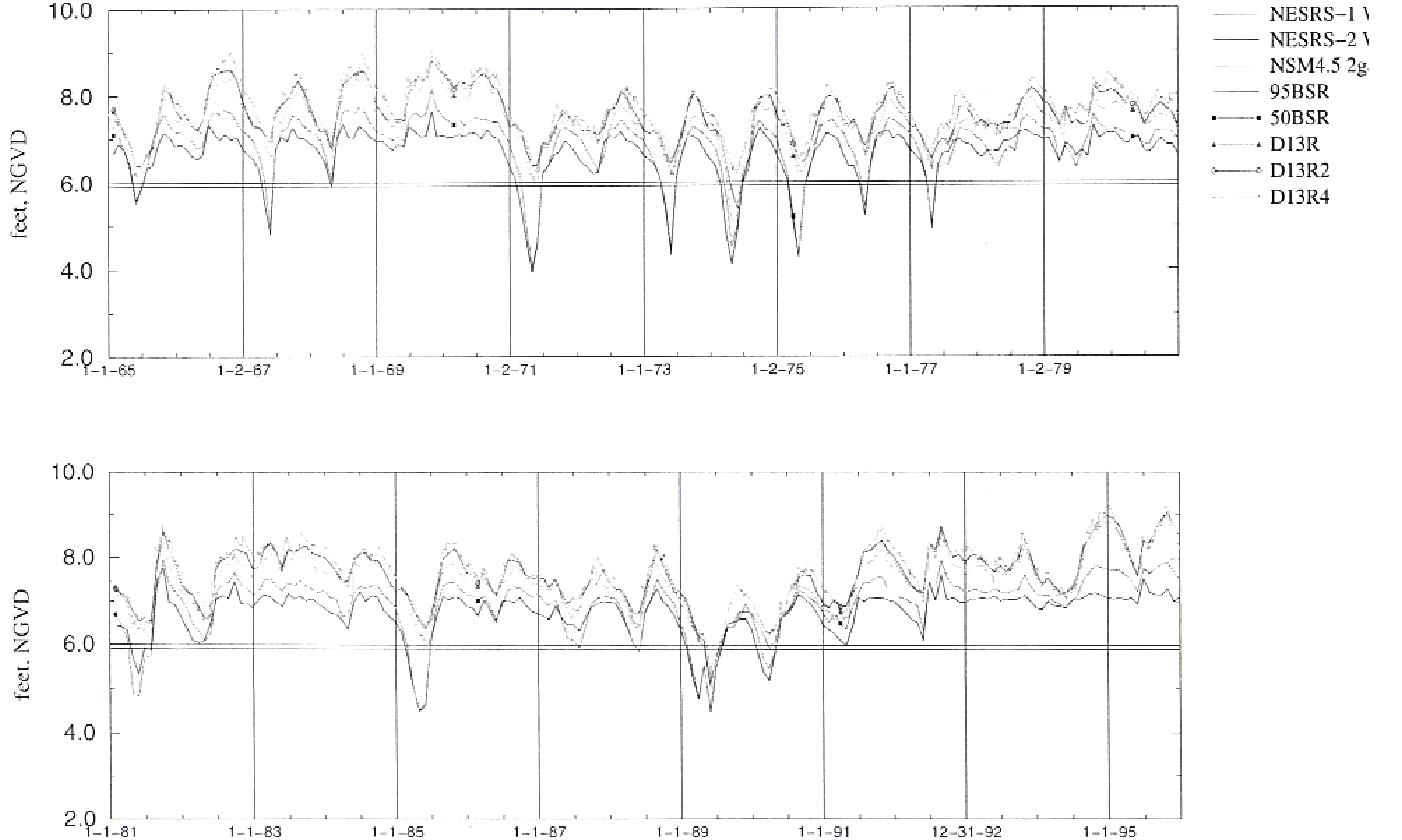
Run date: 01/14/99 07:49:31
For Planning Purposes Only
SFWMM V3.5

Stage Duration Curves at N.E. Shark River Slough
Gage NESRS_2, Cell R21 C24



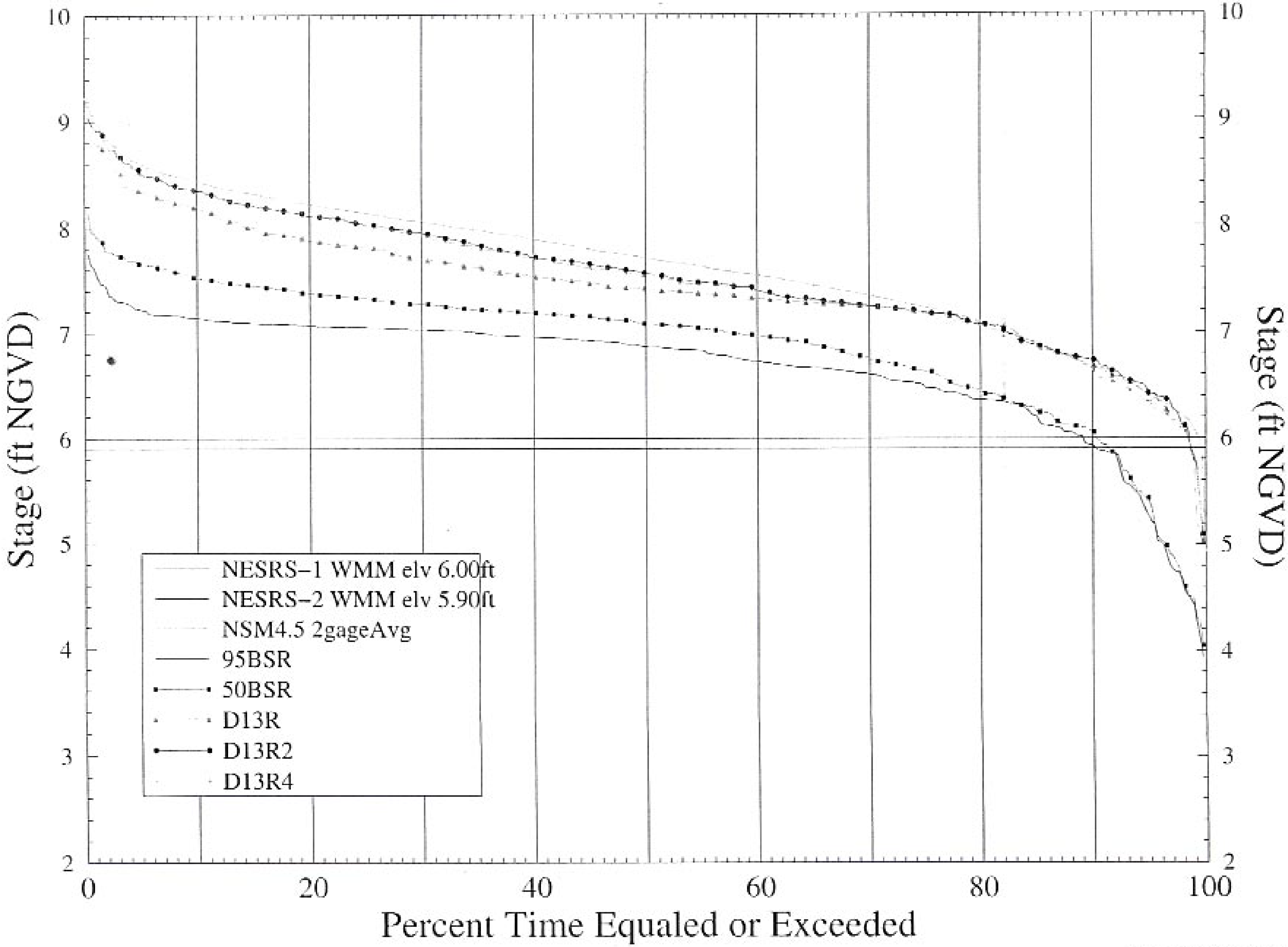
Run date: 01/14/99 09:23:16
For Planning Purposes Only
SFWMM V3.5

2-Gage Average Import Stage Hydrograph for NESRS
Gage NESRS-1(R20 C22) & NESRS-2(R21 C25)



Run date: 01/14/99 07:49:31
For Planning Purposes Only
SFWMM V3.5

2–Gage Avg Import Stg Duration Curves for NESRS
Gage NESRS–1(R20 C22) & NESRS–2(R21 C25)



Run date: 01/14/99 07:49:35
For Planning Purposes Only
SFWMM V3.5

Appendix B-3 Culvert Service Life Estimation

Florida Department of Transportation

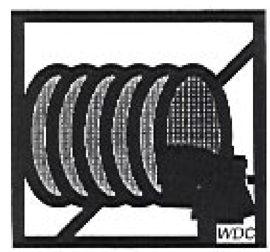
Corrosion Research Laboratory

Culvert Service Life Estimator

Project Name:	Tamiami Trail Evaluation
Work Program Item Number:	
State Job Number:	
Federal Job Number:	
County:	Dade
Elevation:	
Station:	CB-.5(S-3)
Designer:	

Design Life (years): 25

pH	9.45
Resistivity	14368
Chlorides	16
Sulfates	18
Diameter	48



Type Of Culvert	Computed Service Life (years)*
CONCRETE, Typical Dry Cast	360
POLYETHYLENE AND PVC	50
ALUMINUM CANNOT BE USED	
ALUMINIZED STEEL CANNOT BE USED	
GALVANIZED STEEL CANNOT BE USED	

* This program is intended for use as an environmental durability estimator ONLY. It is the designer's responsibility to choose the proper culvert to meet all structural and hydraulic requirements.

Florida Department of Transportation

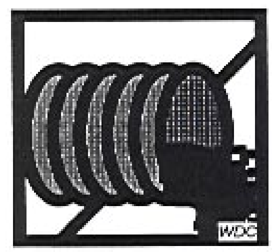
Corrosion Research Laboratory

Culvert Service Life Estimator

Project Name:	Tamiami Trail Evaluation
Work Program Item Number:	
State Job Number:	
Federal Job Number:	
County:	Dade
Elevation:	
Station:	CB-.5(S-6)
Designer:	

Design Life (years): 25

pH	7.67
Resistivity	2096
Chlorides	62
Sulfates	40
Diameter	48



Type Of Culvert	Computed Service Life (years)*
CONCRETE, Typical Dry Cast	360
16 ga. ALUMINUM	173
16 ga. ALUMINIZED STEEL	79
POLYETHYLENE AND PVC	50
16 ga. GALVANIZED STEEL	42

* This program is intended for use as an environmental durability estimator ONLY. It is the designer's responsibility to choose the proper culvert to meet all structural and hydraulic requirements.

Florida Department of Transportation

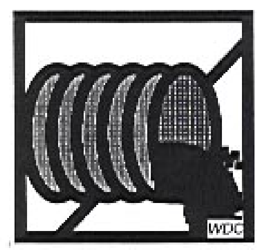
Corrosion Research Laboratory

Culvert Service Life Estimator

Project Name:	Tamiami Trail Evaluation
Work Program Item Number:	
State Job Number:	
Federal Job Number:	
County:	Dade
Elevation:	
Station:	CB-8.5(S-5)
Designer:	

Design Life (years): 25

pH	7.95
Resistivity	2833
Chlorides	66
Sulfates	93
Diameter	48



Type Of Culvert	Computed Service Life (years)*
CONCRETE, Typical Dry Cast	360
16 ga. ALUMINUM	184
16 ga. ALUMINIZED STEEL	85
POLYETHYLENE AND PVC	50
16 ga. GALVANIZED STEEL	48

* This program is intended for use as an environmental durability estimator ONLY. It is the designer's responsibility to choose the proper culvert to meet all structural and hydraulic requirements.

Florida Department of Transportation

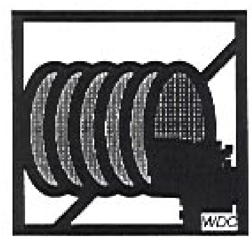
Corrosion Research Laboratory

Culvert Service Life Estimator

Project Name:	Tamiami Trail Evaluation
Work Program Item Number:	
State Job Number:	
Federal Job Number:	
County:	Dade
Elevation:	
Station:	CB-8.5(S-3)
Designer:	

Design Life (years): 25

pH	9.59
Resistivity	8811
Chlorides	52
Sulfates	52
Diameter	48



Type Of Culvert	Computed Service Life (years)*
CONCRETE, Typical Dry Cast	360
POLYETHYLENE AND PVC	50
ALUMINUM CANNOT BE USED	
ALUMINIZED STEEL CANNOT BE USED	
GALVANIZED STEEL CANNOT BE USED	

* This program is intended for use as an environmental durability estimator ONLY. It is the designer's responsibility to choose the proper culvert to meet all structural and hydraulic requirements.

LAW
LAWGIBB Group Member

FACSIMILE TRANSMITTAL SHEET

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
5845 NW 158th Street, Miami Lakes, Florida 33014
Tel: (305) 826-5588 Fax: (305) 826-1799
Email: tmcdanie@lawco.com

To: Mark Jensen	From: G. Thomas McDaniel, P.E.
Company: PBSJ	Date transmitted 8-22-00
Fax Number: 1-407-647-1283	Telephone: (305) 826-5588
Subject:. Tamiami Trail Corrosivity Tests	Fax Number: (305) 826-1799
No. pages transmitted (incl. cover) 5	Hard Copy to Follow: Yes ___ No
CC:	

Urgent _ For Review X Please Comment ___ Please Reply ___ Please Recycle ___

Mark

These are the 4 corrosivity test results. Two tests are in the limerock fill and 2 tests are in the peat layer.

If you have any other questions or comments please contact me.

G. Thomas McDaniel, PE

Principal Geotechnical Engineer

If transmission is not received in good order, please call Tom McDaniel

SEVERN TRENT SERVICES

STL Miami

LAWENG000282
Ricardo Bernai
Law Engineering (MiamiLakes) √
5845 NW 158th Street
Miami Lakes, FL 33014

Page 1
August 17, 2000
Submission # 8000760
Order # 74170
FDEP CompQAP# 990102
FL-DOH Certification# E86349, 86413, 86565

Site Location/Project
Tamiami Trail & Krome Avenue .5,8.5,6,2
40700-0-2369

Sample I.D.: CB-.5(S-3) 3.0 to 4.5 feet Fill - Limerock
Collected: 07/21/00 10:00
Received: 08/15/00 16:00
Collected by: Client

PARAMETER	RESULT	UNITS	METHOD	DETECTION LIMIT	DATE EXT.	DATE ANALY.	ANALYST
Sulfate	18	mg/Kg	ASTM D4130	1.0	08/16/2000	08/16/2000	MC
Chloride	16	mg/Kg	ASTM D512	10.0	08/16/2000	08/16/2000	MC
pH	9.45		ASTM G-51	1.0	08/16/2000	08/16/2000	KOD
ASTM-G57 Resistivity in SOIL expressed as Ohm*cm			MEDF	1			
Resistivity (As Received)	15552	Ω*cm.	ASTM G-57	1.000	08/17/2000	08/17/2000	MC
Resistivity (Saturated)	14368	Ω*cm.	ASTM G-57	1.000	08/17/2000	08/17/2000	MC

BDL: Indicates Analyte is Below Detection LimitMEDF: Matrix Effected Dilution Factor***
Work Subcontracted to Outside Labs Denoted by HRS Cert ID in Analyst Field
Qualifier following result conforms to FAC 62-160 Table 7***Unless otherwise noted, mg/Kg denotes wet weight***
***62-770: If the MDL using the most sensitive and currently available technology is higher than a specific criterion, the PQL shall be used.
Certs: Al. =#41180, Ct. =#PH0217, Ks. =#E270 + E1245, Ky. =#90087, La. =#9601, Md. =#271, Ma. =#M-FL535
NC. =#539, ND. =#R163, OK. =#9523, SC. =#96023, Tn. =#TN02826

Authorized Laboratory Management

LAWENG000282
Ricardo Bernai
Law Engineering (MiamiLakes) √
5845 NW 158th Street
Miami Lakes, FL 33014

Page 4
August 17, 2000
Submission # 8000760
Order # 74173
FDEP CompQAP# 990102
FL-DOH Certification# E86349, 86413, 86565

Site Location/Project
Tamiami Trail & Krome Avenue .5,8.5,6,2
40700-0-2369

7.5 to 9.0 ft
PEAT

Sample I.D.: CB-8.5(S-5)
Collected: 07/24/00 08:10
Received: 08/15/00 16:00
Collected by: Client

PARAMETER	RESULT	UNITS	METHOD	DETECTION LIMIT	DATE EXT.	DATE ANALY.	ANALYST
Sulfate	93	mg/Kg	ASTM D4130	1.0	08/16/2000	08/16/2000	MC
Chloride	66	mg/Kg	ASTM D512	10.0	08/16/2000	08/16/2000	MC
pH	7.95		ASTM G-51	1.0	08/16/2000	08/16/2000	KOD
ASTM-G57 Resistivity in SOIL expressed as Ohm*cm			MEDF	1			
Resistivity (As Received)	2833	Ω*cm.	ASTM G-57	1.000	08/17/2000	08/17/2000	MC
Resistivity (Saturated)	2227	Ω*cm.	ASTM G-57	1.000	08/17/2000	08/17/2000	MC

BDL: Indicates Analyte is Below Detection LimitMEDF: Matrix Effected Dilution Factor***
Work Subcontracted to Outside Labs Denoted by HRS Cert ID in Analyst Field
Qualifier following result conforms to FAC 62 160 Table 7***Unless otherwise noted, mg/Kg denotes wet weight***
***62-770: If the MDL using the most sensitive and currently available technology is higher than a specific criterion, the PQL shall be used.
Certs:AL.=#41180, Ct.=#PH0217, Ks.=#E270 + E1245, Ky.=#90087, La.=#9601, Md.=#271, Ma.=#M-FL535
NC.=#539, ND.=#R163, OK.=#9523, SC.=#96023, Tn.=#TN02826

Authorized Laboratory Management

LAWENG000282
Ricardo Bernal
Law Engineering (MiamiLakes) √
5845 NW 158th Street
Miami Lakes, FL 33014

Page 3
August 17, 2000
Submission # 8000760
Order # 74172
FDEP CompQAP# 990102
FL-DOH Certification# E86349, 86413, 86565

Site Location/Project
Tamiami Trail & Krome Avenue .5,8.5,6,2
40700-0-2369

Sample I.D.: CB-8.5(S-3) 3' to 4.5 ft. Fill – Limerock
Collected: 07/24/00 08:06
Received: 08/15/00 16:00
Collected by: Client

PARAMETER	RESULT	UNITS	METHOD	DETECTION LIMIT	DATE EXT.	DATE ANALY.	ANALYST
Sulfate	52	mg/Kg	ASTM D4130	1.0	08/16/2000	08/16/2000	MC
Chloride	52	mg/Kg	ASTM D512	10.0	08/16/2000	08/16/2000	MC
pH	9.59		ASTM G-51	1.0	08/16/2000	08/16/2000	KOD
ASTM-G57 Resistivity in SOIL expressed as Ohm*cm.			MEDF	1			
Resistivity (As Received)	8811	Ω*cm.	ASTM G-57	1.000	08/17/2000	08/17/2000	MC
Resistivity (Saturated)	8811	Ω*cm.	ASTM G-57	1.000	08/17/2000	08/17/2000	MC

BDL: Indicates Analyte is Below Detection LimitMEDF: Matrix Effected Dilution Factor***
Work Subcontracted to Outside Labs Denoted by HRS Cert ID in Analyst Field
Qualifier following result conforms to FAC 62-160 Table 7***Unless otherwise noted, mg/Kg denotes wet weight***
***62-770: If the MDL using the most sensitive and currently available technology is higher than a specific criterion, the PQL shall be used.
Certs:Al.=#41180, Ct.=#PH0217, Ks.=#E270 + E1245, Ky.=#90087, La.=#9601, Md.=#271, Ma.=#M-FL535
NC.=#539, ND.=#R163, OK.=#9523, SC.=#96023, Tn.=#TN02826

[signature]
Authorized Laboratory Management

LAWENG000282
Ricardo Bernal
Law Engineering (MiamiLakes) √
5845 NW 158th Street
Miami Lakes, FL 33014

Page 2
August 17, 2000
Submission # 8000760
Order # 74171
FDEP CompQAP# 990102
FL-DOH Certification# E86349, 86413, 86565

Site Location/Project
Tamiami Trail & Krome Avenue .5,8.5,6,2
40700-0-2369

Sample I.D.: CB-.5(S-6) 7.5 to 20 ft
Collected: 07/21/00 10:15 Peat
Received: 08/15/00 16:00
Collected by: Client

PARAMETER	RESULT	UNITS	METHOD	DETECTION LIMIT	DATE EXT.	DATE ANALY.	ANALYST
Sulfate	40	mg/Kg	ASTM D4130	1.0	08/16/2000	08/16/2000	MC
Chloride	62	mg/Kg	ASTM D512	10.0	08/16/2000	08/16/2000	MC
pH	7.67		ASTM G-51	1.0	08/16/2000	08/16/2000	KOD
ASTM-G57 Resistivity in SOIL expressed as Ohm*cm			MEDF	1			
Resistivity (As Received)	2096	Ω*cm.	ASTM G-57	1.000	08/17/2000	08/17/2000	MC
Resistivity (Saturated)	2096	Ω*cm.	ASTM G-57	1.000	08/17/2000	08/17/2000	MC

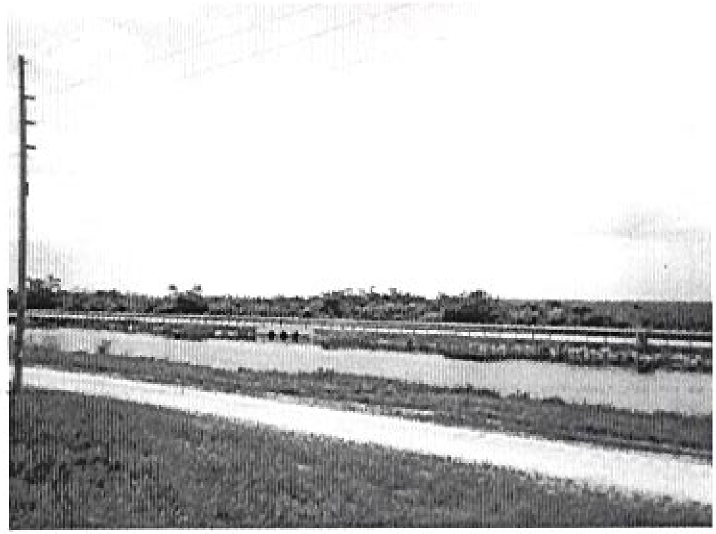
BDL: Indicates Analyte is Below Detection LimitMEDF: Matrix Effected Dilution Factor***
Work Subcontracted to Outside Labs Denoted by HRS Cert ID in Analyst Field
Qualifier following result conforms to FAC 62-160 Table 7****Unless otherwise noted, mg/Kg denotes wet weight***
***62-770: If the MDL using the most sensitive and currently available technology is higher than a specific criterion, the PQL shall be used.
Certs: Al. =#41180, Ct. =#PH0217, Ks. =#E270 + E1245, Ky. =#90087, La. =#9601, Md. =#271, Ma. =#M-FL535
NC. =#539, ND. =#R163, OK. =#9523, SC. =#96023, Tn. =#TN02826

Authorized Laboratory Management

APP. C

APPENDIX C - PAVEMENT INFORMATION

View from Levee L-29 looking SE.

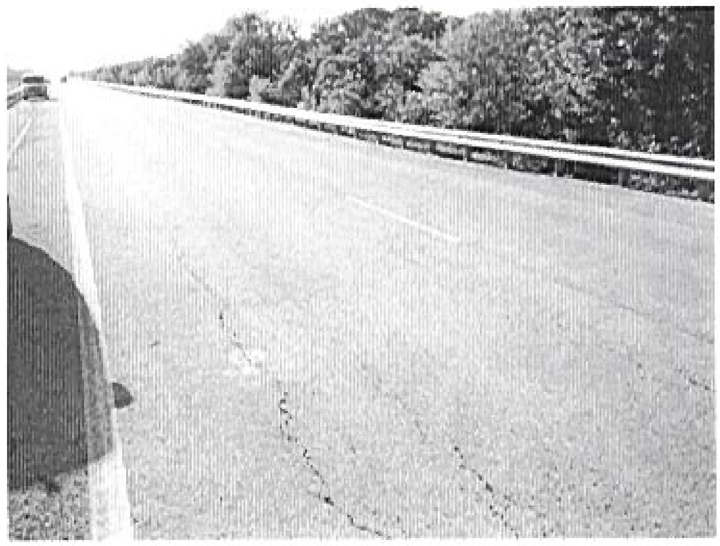


View from south shoulder, looking NE

View of test location DCB-100, approximately at Station 771+00.

Typical longitudinal crack in outside wheelpath, Eastbound lane.

View of test location DCB-5, approximately at Station 1280+20.



View of WB Outside wheelpath and test location that was not used. Approximate station 1227+40.

View of EB Outside wheelpath and test location that was not used. Approximate station 1149+80.

View of test location DCB-20, approximately at Station 1200+10.

View of test location CB-25, approximately at Station 1173+00.

Appendix C-1 - Florida DOT Pavement Information

1. Historic Maintenance Costs
2. Typical Funded Annual Maintenance
3. Minimum Overlay Calculations
4. Pavement Condition Ratings- Florida DOT

4/16/00 FY 01/02 MAINTENANCE BUDGET NEEDS
TAMIAMI TRAIL

ESTIMATE BASED ON MP 13.131 TO MP 24.410

ctivity Number	Description	Total Needs $
411	Plant Mix Patching(Manual)	$4,682.08
412	Plant Mix Patching(Mech.)	$2,216.70
414	Base Repair	$401.64
421	Pressure Grouting	$266.51
423	Concrete Pavement Joint Repair	$0.00
424	Concrete Slope Pavt Joint Repair	$0.00
425	Concrete Pavement Surface Repair	$0.00
431	Motor Grader Operation	$0.00
432	Rep N-paved Shld, Slopes, Ditches (	$2,508.92
433	Sodding	$1,933.04
435	Seeding, Fertilizing and Mulching	$1,223.90
436	Reworking Shoulders	$4,338.82
437	Misc. Slope and Ditch Repair	$4,441.07
451	Clean Drainage Structures	$305.83
456	Repair or Replace Storm Dr, Side Dr	$553.85
457	Concrete Repair	$0.00
459	Concrete Sidewalk Repair	$0.00
461	Roadside Ditches - Clean & Reshape	$5,063.46
464	Outfall Ditches - Clean & Repair	$0.00
471	Large Machine Mowing	$519.58
482	Slope Mowing	$17,524.39
484	Intermediate Machine Mowing	$80.07
485	Small Machine Mowing	$74.85
487	Weed Control(Manual)	$0.00
489	Wildflowers	$148.51
490	Fertilizing	$1,074.76
492	Tree Trimming and Removal	$2,583.83
493	Landscape Area Maintenance	$0.00
494	Chemical Weed and Grass Control	$2,510.53
497	Chemical Weed and Grass Control (Br	$296.03
519	Delineators	$1,065.56
520	Signs (Ground Signs 30 sf or less)	$864.23
521	Signs (Ground Signs over 30 sf and	$0.00

522 Sign Cleaning	$40.67
526 Guardrail Repair	$22,456.94
527 Fence Repair	$0.00
530 Attenuator Inspect. & Serv.	$0.00
531 Attenuator Repair	$0.00
532 Pavement Striping (Large Machine)	$9,098.90
534 Pavement Symbols	$327.72
537 Raised Pavement Marker Replacement	$3,768.44
540 Graffiti Removal	$0.00
541 Roadside Litter Removal	$4,409.43
542 Road Sweeping(Manual)	$0.00
543 Roadsweeping(Mech.)	$439.48
545 Edging and Sweeping	$0.00
781 Weight Station Maintenance	$0.00
805 Bridge Joint Repair	$0.00
806 Bridge Deck Maintenance And Repair	$0.00
810 Bridge Handrail Maintenance And Rep	$0.00
825 Superstructure Maintenance And Repa	$0.00
845 Substructure Maintenance And Repair	$0.00
859 Channel Maintenance	$0.00
861 Routine Bridge Electrical Maintenan	$0.00
865 Routine Bridge Mechanical Maintenan	$0.00
869 Movable Bridge Structural Maintenan	$0.00
995 Maintenance Support Services	$4,760.99
Total	$99,980.72

Florida Department of Transportation

JEB BUSH
GOVERNOR

THOMAS F. BARRY, JR.
SECRETARY

MEMORANDUM

DATE: August 21, 2000

TO: Barbara Culhane, Environmental Administrator

FROM: Guy Gladson, District Drainage Permit Engineer

COPIES: Gus Pego, Ron Steiner, John Slaton

SUBJECT: Maintenance Costs on Tamiami Trail (10 mile portion starting 1 mile west of Krome Avenue)

Attached are the FDOT's average estimated annual maintenance activity costs for the 10 mile portion of concern on the Tamiami Trail. The costs are based on an average of the last 3 years of maintenance performed on Tamiami Trail (Section 87110). This information was obtained from the Maintenance Management System (MMS) and is only an estimate. Inspection costs are not identified through the MMS, therefore an additional 15% was added to the actual activity costs.

Maintenance efforts associated with unpaved shoulder and asphalt repair are due to mainly failing shoulders. Maintenance expects these costs to significantly increase in the future as the sub-base continues to fail.

Please feel free to call John Slaton (305-470-5358) or myself (305-470-5372) for further information or clarification.

GG/ro

TAMIAMI TRAIL MAINTENANCE Dollar Analysis
18-Aug-00

AVERAGE ANNUAL COST FOR TEN MILES ONLY

ACTIVITY	In-house Maintenance MMS	Contract Maintenance Costs	TOTAL Estimate	Current Schedule
Mowing	$0	$20,060	$20,060	Slope Mowing- 4 times a year Tree Trimming with Slope Mower- 4 time a year
Litter Removal	$0	$3,392	$3,392	Litter removal- 12 times a year
Guardrail repair	$10,350	$1,328	$11,678	As needed basis
Sign repair	$1,243	$0	$1,243	As needed basis
Herbicide	$545	$0	$545	Once a year
Bridge Repairs	$125	$0	$125	As needed basis
Asphalt Repair	$251	$0	$251	As needed basis
Unpaved Shoulder Repair	$1,151	$0	$1,151	As needed basis
TOTAL	$13,665	$21,398	$35,054	

$35,054 \times \frac{11,279}{10} = \cancel{58,559}$ 39,537

~~≈ 38,600~~ 39,500

for 11 miles of MWD

Estimates based on 3 year activity average costs, except mowing costs based on last year Contract dollars. Mowing cycles are expected to increase in future years when current contract expires.

Costs based on MMS cost information. Tamiami Trail (section 87110) is 25.715 miles in total length. This report took average cost per mile of section 87110 and prorated to ten miles to obtain the costs above.

Guardrail based on actual repairs within limits of ten miles section, average over three years.

Striping for the ten mile section is in good condition. Striping schedule once every four years.

FLEXIBLE PAVEMENT DESIGN SUMMARY SHEET
Preliminary , subject to change

Prepared by: Roberto Perez

Date: May 6, 1999

W.P.I. No.

SR/90/US41/Tamiami Trial

State Project No. 87110-

From 11 miles w of SR 997

F.A.P. No.

To SR 997/Krome Ave

County Miami-Dade

Project Length 11 miles

Opening Year 2002

LBR 40 SSV ---

Design Year 2022

Mr 84 Mpa (12k Psi)

80 KN/eq.Loads 3,100,000

%Reliability 90

SN Required 3.45

Design Speed 55 MPH

Type of Work and location: Reconstruction (Existing Profile varies from 10.3 to 12.0 Ft NGVD, Prop. Profile will be at 12.0 Ft NGVD

Existing Pavement:

	Tk.	Coef.	SN
Sub-grade Stabilization (LBR 40)	12"	0.08	0.96
Limerock Base 12" tk.	12"	0.18	2.16
Type S Asphaltic Conc. 3.5" tk	3.5"	0.25	0.87
FC-2, Friction Course 5/8"tk	5/8"	0.00	0.00
			3.99

Prop. Profile Grade :
9.50 (DHW)+1ft Clearence+1.5 ft(Pav't tk.+cross slope=12.0 Ft NGVD
It means raise the Road from 0 to (12.0-10.3) 1.7 Ft= 20.4 inches

Prop. Pavement:
Mill FC-2, entire corridor

		SN
Existing pavement SN		3.99
Type S overbuild(4" to 12.4")(400 to 1240 lb/sy)		0.00
OBG 9 *		1.80
Type `SP' Struct.Cse.(Level 3)2" tk	0.44	0.88
FC5-Friction Course,(80lb/sy),3/4"tk	0.00	0.00
	Design SN	**6.67**

*Optional code permite 609 (6"ABC-3)

Approved by: [signature]
Pav.Des.Eng Date : 5-6-99

Concurred By: [signature]
Dist.Des.Eng. Date: 5-6-99

Sheet 1 of 1

ALL SYSTEM PAVEMENT CONDITION FORECAST

PAVEMENT IMPROVEMENT PROJECTS IN FM WPA TENTATIVE PLAN -- 2001 - 2006, EXTRACTED ON &EXDATE

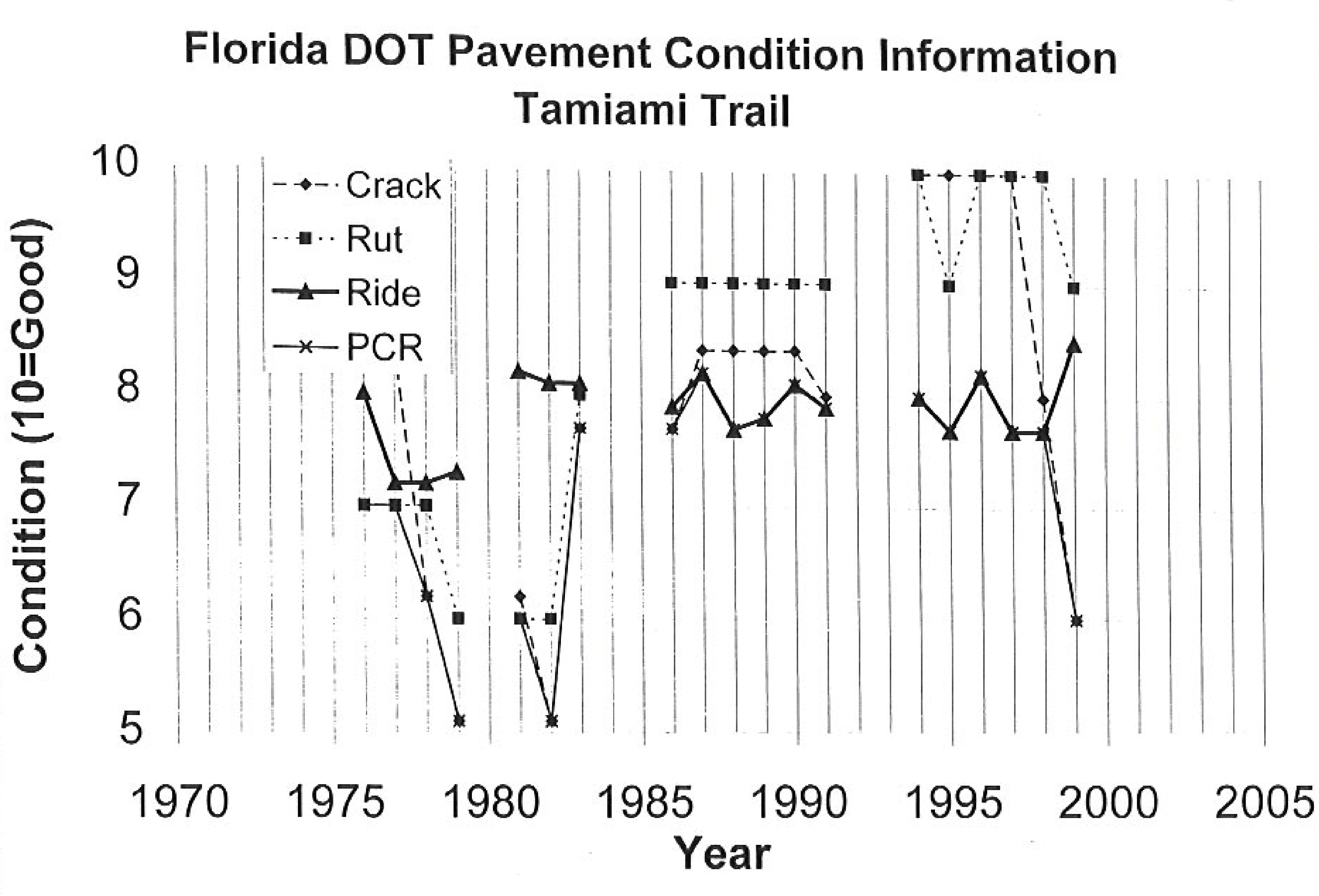
SORT BY RDWYID MILEPOST R ASCENDING L DESCENDING

```
---------------------------------------------  DISTRICT = 6   COUNTY = DADE      ---------------------------------------------
RDWYID        BMP     EMP RW SYSTEM TYPE DISTRESS SURVEYED YEAR
 SR   US   G_BMP  G_EMP LN SPEED  AADT RATINGS  1976  1977  1978  1979  1980  1981  1982  1983  1984  1985  1986  1987  1988  FUTURE
INTERSECT AT (MP|SIDE)              %T ========
ITMSEG-P    W_BMP  W_EMP RW FY-P WKMX-P
CONTRACTOR (YEAR--PAVEMENT ONE YR OLD)         1989  1990  1991  1992  1993  1994  1995  1996  1997  1998  1999  2000         2005
ITMSEG-F    W_BMP  W_EMP RW FY-F WKMX-F                                                                                      (REG)
87110000    8.432 13.131  C    1       1 CRACKING  9.4   9.4   9.4   8.4         7.0   7.0   9.4
 90   41                  2   55    5200 RIDE      8.5   8.0   8.0   7.8         8.5   8.6   8.3               9.4   9.4   9.4
BRIDGE #29-OVER CANAL(10.4C)        11.5 RUTTING   7.0   8.0   8.0   8.0         7.0   7.0   8.0               8.3   8.7   8.2
2499241     3.920 13.220  C 1995    0221 CRACKING  8.0   9.4  10.0  10.0   9.0   9.0   9.0   9.0   9.0  10.0  10.0  10.0   9.0
PAN AMERICAN CONSTRUCTION CO(1998)       RIDE      8.3   8.6   8.4   7.7   8.0   7.5   7.4   7.6   7.6   8.1   8.8   8.9
                                         RUTTING   9.0   9.0   9.0   9.0   8.0   9.0   9.0   9.0  10.0  10.0  10.0  10.0
87110000   13.131 24.410  C    1       1 CRACKING  8.4   8.4   6.2*  5.1*        6.2*  5.1*  7.7               7.7   8.4   8.4
 90   41                  2   55    5200 RIDE      8.0   7.2   7.2   7.3         8.2   8.1   8.1               7.9   8.2   7.7
BRIDGE #31-OVER CANAL(13.2C)        11.5 RUTTING   7.0   7.0   7.0   6.0*        6.0*  6.0*  8.0               9.0   9.0   9.0
2492121    13.200 24.400  C 1991    0222 CRACKING  8.4   8.4   8.0               10.0  10.0  10.0  10.0   8.0   6.0*  6.0*         1.0*
WHITE CONSTRUCTION CO         (1994)     RIDE      7.8   8.1   7.9               8.0   7.7   8.2   7.7   7.7   8.5   8.3          9.0
4056361    13.131 24.410  C 2002    0012 RUTTING   9.0   9.0   9.0              10.0   9.0  10.0  10.0  10.0   9.0   9.0          9.0
87110000   24.410 25.715  C    1       1 CRACKING  8.4   8.4   6.2*  7.0         5.8*  5.1*  7.7               7.7   8.4   8.4
 90   41                  2   55    5200 RIDE      8.0   7.2   7.2   7.3         8.2   8.1   8.1               7.9   8.2   7.7
SIDE ROAD(24.4C)                    11.5 RUTTING   7.0   7.0   7.0   7.0         6.0*  6.0*  8.0               9.0   9.0   9.0
2499231    24.420 25.698  C 1995    0221 CRACKING  8.4   8.4   8.0   8.0   8.0   8.0   7.0   7.0   7.0  10.0  10.0  10.0
PAN AMERICAN CONSTRUCTION CO(1998)       RIDE      7.8   8.1   7.9   7.2   7.1   7.4   7.0   7.3   6.8   8.2   8.5   8.3
                                         RUTTING   9.0   9.0   9.0   8.0   7.0   8.0   8.0   8.0   8.0  10.0   9.0   9.0
---------------------------------------------------------------------------------------------------------------------------------
```

FLORIDA DEPARTMENT OF TRANSPORTATION
FLEXIBLE PAVEMENT CONDITION SURVEY -- 1999
SORT BY DISTRICT RDWYID MILEPOST R ASCENDING L DESCENDING

D I	RDWYID	BEGIN M.P.	END M.P.	NET LENGTH	RDWY	LANE	SYST	TYPE	SR NO.	US NO.	MO	YR	RAVEL	PAT	IRI	<< DEDUCTS >> RUT LAS	CRACKING CW	CRACKING CD	<< RATINGS >> CRK	RUT	RIDE	CTRYKPE	** REMARKS **
6	87090000	18.492	18.764	0.273	C	4	1	1	25	27	04	98			103	0	0.0	0.0	10.0	10	7.5		P/L
6	87090000	18.764	19.317	0.470	C	2	1	1	25	27	04	98			115	1	0.0	0.0	10.0	9	7.6		
6	87090000	19.317	19.638	0.252	R	2	1	1	25	27	04	98			147	1	0.0	0.0	10.0	9	7.0		
6	87090000	19.317	19.638	0.315	L	2	1	1	25	27	04	98			205	1	0.0	0.0	10.0	9	6.7		T/L
6	87090000	14.990	15.411	0.195	L	2	1	1	25	27	04	98		L	136	2	0.5	0.0	9.5	8	6.6		RIP.PT
6	87090000	13.022	13.493	0.457	L	3	1	1	25	27	04	98		L	141	1	2.0	0.0	8.0	9	6.8		RIP.DEP.PT
6	87090000	10.512	13.022	2.511	L	3	1	1	25	27	04	98		L	118	1	2.0	1.0	7.0	9	6.6		RIP.DEP.PT.M/L
6	87090000	9.884	10.512	0.420	L	3	1	1	25	27	04	98			86	2	0.0	0.0	10.0	8	7.5		M/L
6	87090000	5.317	9.884		L	3	1	8	25	27													UNDER CONST
6	87090000	0.000	5.317	5.269	L	2	1	1	25	27	04	98	M 1- 5%		65	1	0.5	0.0	9.5	9	8.4		RIP.RAV
6	87091000	0.000	2.461	2.432	C	2	1	1	994		04	98	M 1- 5%	L	164	2	2.0	1.5	6.5	8	6.4	A	RIP.DEP.RAV.PT
6	87091000	2.461	4.328	1.747	C	2	1	1	994		04	98		L	142	1	2.0	1.0	7.0	9	6.8	C	RIP.SPL.DEL.PT
6	87091000	4.328	5.000	0.726	C	2	1	1	994		04	98		L	115	0	1.0	1.0	8.0	10	7.8		RIP.PT
6	87091000	5.000	6.853	1.815	R	2	1	7	994		04	98			76	0	0.0	0.0	10.0	10	8.4		NEW PAVT
6	87091000	6.853	7.086	0.237	R	2	1	1	994		04	98		L	126	0	1.0	0.0	9.0	10	7.2		RIP.PT
6	87091000	7.086	8.058	0.916	R	2	1	7	994		04	98			93	0	0.0	0.0	10.0	10	7.9		NEW PAVT
6	[illegible]91000	7.086	8.058	0.977	L	2	1	5	994		04	98			88	0	0.0	0.0	10.1	10	8.4		NEW CONST
[illegible]	[illegible]91000	6.853	7.086	0.211	L	2	1	1	994		04	98		L	166	0	1.0	0.0	9.0	10	6.2		RIP.PT
6	87091000	5.000	6.853	1.820	L	2	1	5	994		04	98			76	0	0.0	0.0	10.0	10	8.4		NEW CONST
WBT 6	87110000	0.000	3.893	3.888	C	2	1	1	90	41	05	98		L	127	1	2.0	0.0	8.0	9	6.9	C	RIP.PT
6	87110000	3.893	7.722	3.721	C	2	1	1	90	41	05	98			52	0	0.0	0.0	10.0	10	8.8		
6	87110000	7.722	8.116	0.386	C	2	1	1	90	41	05	98			55	0	0.0	0.0	10.0	10	8.9		
6	87110000	8.116	13.131	4.964	C	2	1	1	90	41	05	98			50	0	0.0	0.0	10.0	10	8.8		
6	87110000	13.131	24.410	11.170	C	2	1	1	90	41	05	98			77	1	3.0	1.0	6.0	9	8.5	C	
6	87110000	24.410	25.715	1.258	C	2	1	1	90	41	05	98			62	1	0.0	0.0	10.0	9	8.5		
:AST 6	87120000	0.000	5.035	4.948	R	2	1	1	90	41	05	98			68	1	0.0	0.0	10.0	9	8.4		

D T	RDWYID	BEGIN M.P.	END M.P.	NET LENGTH	R D W Y	L A N E	S Y S T	T Y P E	SR NO.	US NO.	MO YR	RAVEL	P A T	IRI	<< DEDUCTS >> RUT ULT	CRACKING CW	CO	<< RATINGS >> CRK	RUT	RIDE	CT RY KP E	** REMARKS **
6	87090000	14.943	15.411	0.297	R	2	1	1	25	27	04 97		L	166	1	1.0	0.5	8.5	9	7.4		RIP,PT,P/L
6	87090000	15.411	17.400		C		1	4	25	27												RIGID PAVT
6	87090000	17.400	18.492	0.976	C	2	1	1	25	27	04 97	M 1- 5%	L	226	2	2.5	1.0	6.5	8	6.4		RIP,RAV,PT,P/L
6	87090000	18.492	18.764	0.272	C	4	1	1	25	27	04 97			140	0	0.0	0.0	10.0	10	7.8		P/L
6	87090000	18.764	19.270	0.499	C	2	1	1	25	27	04 97			131	1	0.0	0.0	10.0	9	7.9		
6	87090000	19.270	19.638	0.330	R	2	1	1	25	27	04 97			183	1	0.0	0.0	10.0	9	7.1		
6	87090000	19.270	19.638	0.323	L	2	1	1	25	27	04 97			205	1	0.0	0.0	10.0	9	6.8		T/L
6	87090000	14.943	15.411	0.313	L	2	1	1	25	27	04 97		L	205	2	0.5	0.0	9.5	8	6.8		RIP,PT
6	87090000	13.022	13.450	0.423	L	3	1	1	25	27	04 97		L	148	1	0.5	0.0	9.5	9	7.7		RIP,DEP,PT
6	87090000	10.512	13.022	2.561	L	3	1	1	25	27	04 97		L	131	1	0.5	1.0	8.5	9	7.9		RIP,DEP,PT,M/L
6	87090000	5.166	10.512	5.178	L	3	1	1	25	27	04 97			70	2	0.5	0.0	9.5	8	8.9		SPL,M/L
6	87090000	0.000	5.166	5.212	L	2	1	1	25	27	04 97	M 1- 5%		138	1	0.0	0.0	10.0	9	7.8		RIP,RAV
6	87091000	0.000	2.461	2.870	C	2	1	1	994		03 97	M 1- 5%	L	176	2	2.0	1.0	7.0	8	7.2	A	RIP,DEP,RAV,PT
6	87091000	2.461	4.328	1.700	C	2	1	1	994		03 97	L 6-25%	L	150	1	2.0	1.0	7.0	9	7.6	C	RIP,RAV,DEL,PT
6	87091000	4.328	5.000	0.366	C	2	1	1	994		03 97		L	185	1	0.5	0.0	9.5	9	7.1		RIP,PT
6	87091000	5.000	6.853		C	2	1	8	994													UNDER CONST
6	87091000	6.853	7.086	0.235	R	2	1	1	994		03 97		L	152	0	1.0	0.0	9.0	10	7.6		RIP,PT
[illegible]	[illegible]1000	7.086	8.058		C	2	1	8	994													UNDER CONST
6	87091000	6.853	7.086	0.220	L	2	1	1	994		03 97		L	157	0	1.0	0.0	9.0	10	7.5		RIP,PT
6	87110000	0.000	3.893	3.894	C	2	1	1	90	41	03 97			189	0	0.5	0.0	9.5	10	7.0	C	RIP
6	87110000	3.893	7.722	3.753	C	2	1	7	90	41	03 97			120	0	0.0	0.0	10.0	10	8.1		NEW PAVT
6	87110000	7.722	8.116	0.575	C	2	1	7	90	41	03 97			101	0	0.0	0.0	10.0	10	8.4		NEW PAVT
6	87110000	8.116	13.131	4.758	C	2	1	7	90	41	03 97			119	0	0.0	0.0	10.0	10	8.1		NEW PAVT
6	87110000	13.131	24.613	11.200	C	2	1	1	90	41	03 97			142	0	2.0	0.0	8.0	10	7.7	C	
6	87110000	24.613	25.715	1.289	C	2	1	7	90	41	03 97			115	0	0.0	0.0	10.0	10	8.2		NEW PAVT
6	87120000	0.000	5.035	4.956	R	2	1	1	90	41	03 97			95	0	0.0	0.0	10.0	10	8.5		


Florida DOT Pavement Condition Information
Tamiami Trail
Crack
Rut
Ride
PCR
Condition (10=Good)
10
9
8
7
6
5
1970
1975
1980
1985
1990
1995
2000
2005
Year

Appendix C-2 - Falling Weight Deflectometer Results

www.eresnet.com

Pavement Engineering Specialists

ERES CONSULTANTS
A Division of Applied Research Associates, Inc.

August 22, 2000

Mr. Mark Jansen
PBS&J
1560 Orange Avenue, Suite 700
Winter Park, Florida 32789
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Subject: **FWD Results for U.S. 41, Tamiami Trail – Miami, Florida.**
ERES Project No. 0276

Dear Mr. Jansen:

ERES Consultants is pleased to submit the falling weight deflectometer (FWD) testing results for the above referenced project.

We appreciate the opportunity to be of service to PBS&J, and if you have any questions or comments, please do not hesitate to contact us.

Sincerely,

ERES CONSULTANTS
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Madan Gon

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Background

As part of a pavement evaluation and design study being performed by PBS&J on the Tamiami Trail, ERES was subcontracted to perform structural evaluation with a falling weight deflectometer (FWD). The project is located in the Everglades just west of Miami and begins at a point 1.35 miles to the east of Structure S334 and extends 12.5 miles west. This portion of the Tamiami Trail consists of two lanes (one lane per direction) of an asphalt concrete (AC) pavement over a crushed limerock base. The natural soil in this area is peat approximately 4-ft in depth overlying limestone bedrock. An embankment layer using a granular material, approximately 2 to 3-ft depth, has been constructed over the entire length of the project.

Pavement layer thickness data were determined through ground-penetrating radar (GPR) survey and pavement coring and boring. The AC layer thicknesses provided by GPR were highly variable, as shown in figure 1. The point-by-point values used in FWD data analysis are included in appendix table A.1. A constant base thickness of 12 in was assumed, based on results of subsurface borings reported by PBS&J.

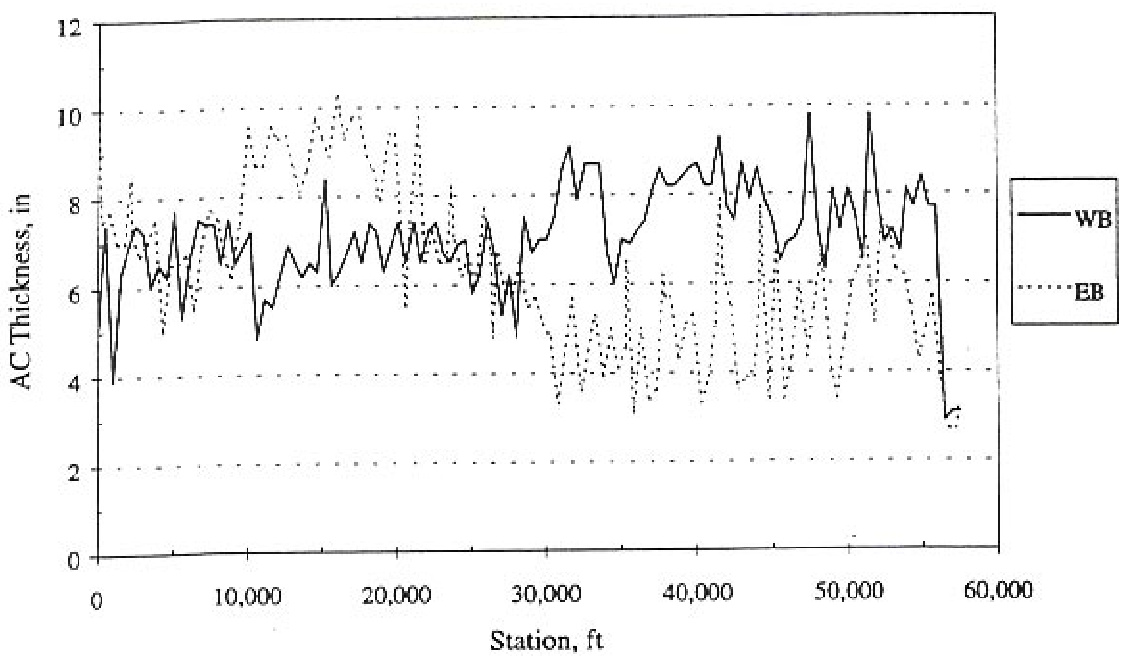


Figure 1. AC layer thicknesses determination by GPR.
U.S. 41, Tamiami Trail – Miami, Florida.

FWD Data Collection

FWD testing using one of ERES' Dynatest Model 8081 falling weight deflectometers (figure 2) was conducted on July 20 and 21, 2000. Testing was performed during the approximate hours of 8:30 am to 2:30 pm, using moving lane closures and flaggers provided by All-American Barricades. Testing was performed in the outer wheel path at 500-ft intervals per lane, with the test points between WB and EB lanes staggered, effectively providing 250-ft spacing along the pavement centerline.

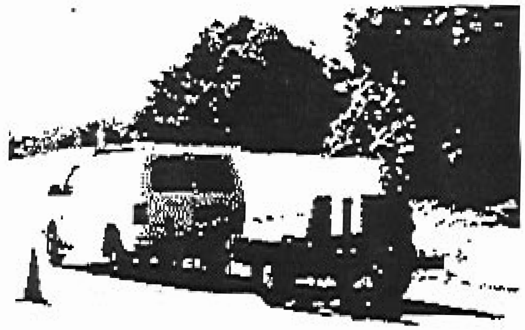


Figure 2. ERES' FWD performing structural evaluation.

Data were collected at target loads of 9, 12, and 16 kips, with sensors placed at distances of 0, 8, 12, 18, 24, 36, and 60 in from the load center. In addition to the load and deflection data, the air and pavement surface temperatures, and time and date stamps were recorded at each test point. Twice each day the pavement mid-depth temperature was measured manually by drilling into the AC layer.

FWD Results

Two types of deflection data analysis were performed—normalization of maximum deflection to load and temperature, and backcalculation of pavement and subgrade layer moduli.

Normalization of Maximum Deflections to Load and Temperature

The largest pavement deflection occurs at the center of the load and is referred to as the maximum deflection, D_0. Due to changes in pavement stiffness at each test location, the resulting dynamic load varies slightly from its target load. To standardize all maximum deflections to the same load level, a linear extrapolation of the load/deflection relationship is performed. This process is referred to as normalization to load.

In the case of highway pavements, the 18-kip equivalent single axle load (ESAL) is a standard for pavement design, and the maximum deflection for the drop height corresponding to a 9-kip target load (equal to one side of an 18-kip single axle) was normalized to a load of 9,000 lbf. In addition, AC pavement deflections are temperature dependent. The temperature correction method presented in the *1993 AASHTO Guide for Design of Pavement Structures* was used to normalize maximum deflections to a temperature of 68°F.

The maximum deflections normalized to 9,000 lbf and 68°F are shown in figure 3. The majority of deflections range from 5 to 15 mils (1 mil = 0.001 in), with an overall mean of approximately 10 mils. Deflections in this range are typical for the pavement structure and subgrade type of this section. It can be seen that the pavement section from approximately 55,000 ft to the end of the project exhibits very low deflections, in spite of having only a thin AC layer, approximately 3 in. Generally, thinner pavement structures result in higher deflections; however, in this case, the lower deflections are due to a very stiff foundation in this area. In general, the difference in D_0 between EB and WB lanes at a given station is due to the combination of differing AC thicknesses and subgrade support.

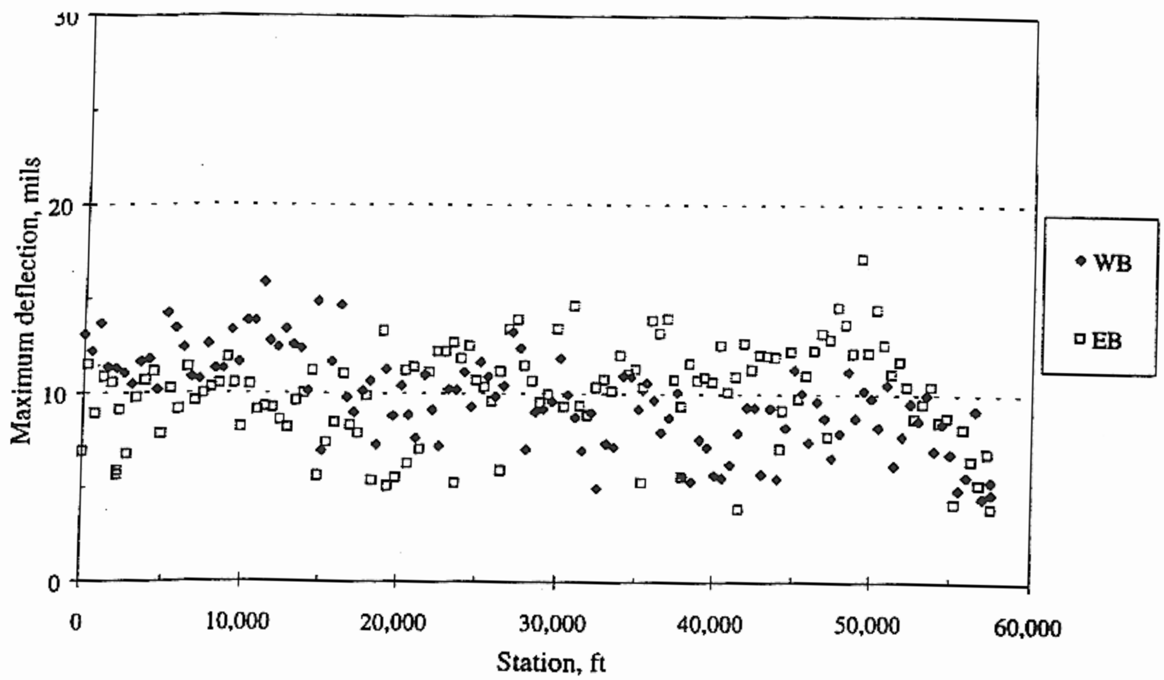


Figure 3. Maximum deflection normalized to 9,000 lbf and 68°F (D_0).
U.S. 41, Tamiami Trail – Miami, Florida

Determination of Pavement Layer Moduli

The FWD data were analyzed using the flexible pavement backcalculation procedure presented in the *1993 AASHTO Guide for Design of Pavement Structures*. For flexible pavements, the AASHTO method models the pavement as a two-layer system. One is the combination of all pavement layers above the subgrade (e.g., the asphalt and granular layers), and the other layer is the subgrade. The AASHTO method uses an outer sensor (say, 24 in) for characterization of the subgrade stiffness and the deflection at the center of the load (i.e., the maximum deflection) for determination of the combined stiffness of all layers above the subgrade.

The outputs of this method are the subgrade resilient modulus, M_r, and the composite pavement modulus, E_p. Based on the pavement layer thicknesses and E_p, the effective structural number, SN_{eff}, of the in situ asphalt pavement is determined. Structural number is the concept used in AASHTO for characterization of the structural capacity of the pavement layers. In the AASHTO design model, M_r and SN_{eff} are primary inputs in the determination of the load-carrying capacity of flexible pavements.

Figure 4 shows the M_r values for the WB and EB lanes. The majority of values range from 5,000 to 12,000 psi, with an overall mean of 7,500 psi. M_r results in this range are indicative of fair subgrade support. In this case, the backcalculated M_r values reflect the improvement of the weak peat layer by the granular embankment of variable thickness.

It can be seen that extremely high subgrade resilient moduli were detected from approximately station 56,000 to the end of the project. This significant increase in stiffness can be attributed to either an increase in the thickness and quality of embankment, or a shallow depth to bedrock.

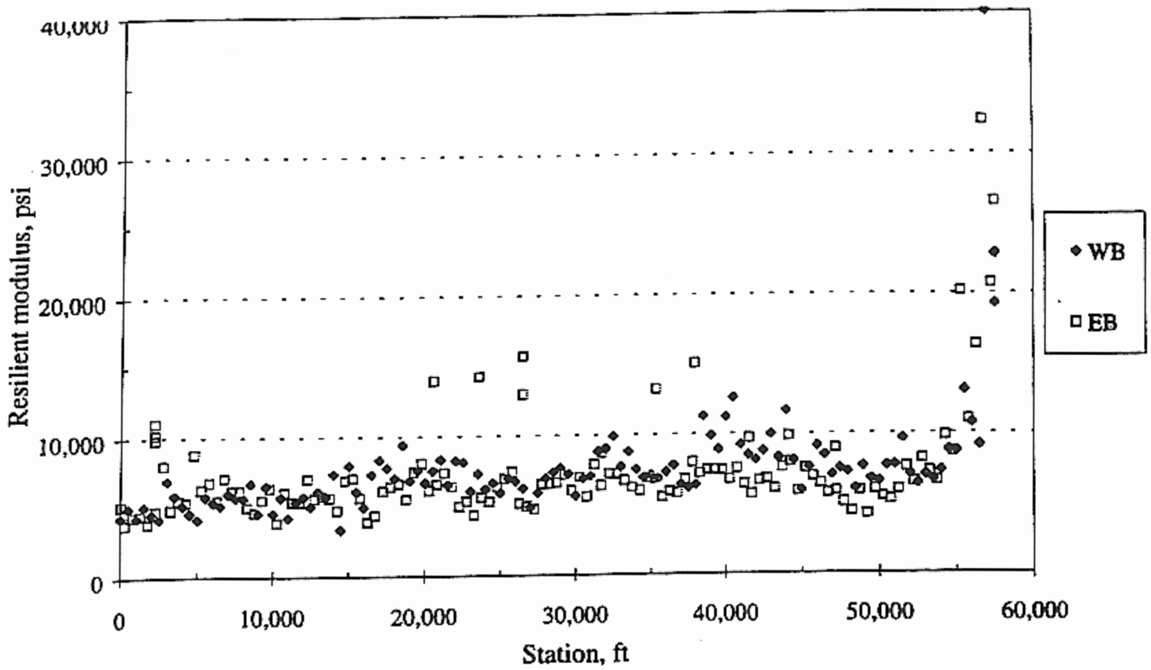


Figure 4. Subgrade resilient modulus (M_r).
U.S. 41, Tamiami Trail – Miami, Florida

The backcalculated E_p values are presented in figure 5. The results are highly variable, ranging from approximately 80,000 to 350,000 psi. This variability may be due to variations in the actual base thickness from the assumed constant thickness of 12 in.

Figure 6 presents the SN_{eff} results for the WB and EB lanes. The majority of values range between 3.5 and 6 in, reflecting the high variability in backcalculated E_p values and layer thicknesses. SN_{eff} values in this range are indicative of medium to thick AC pavements. SN_{eff} is highly dependent on the total pavement thickness, and this can be seen in the difference in results between WB and EB lanes, which were reported to have significantly different AC thicknesses at several locations along the project.

The numerical point-by-point FWD results for D_0, M_r, E_p, and SN_{eff} are included in appendix table B.1.

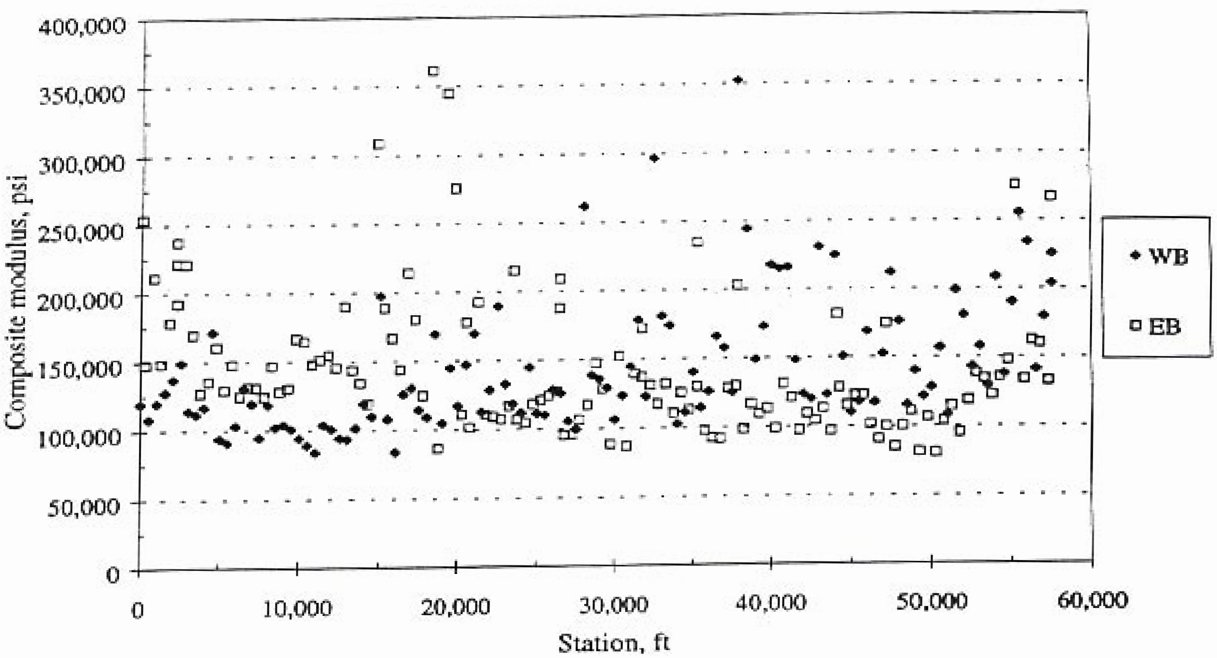


Figure 5. Pavement composite modulus (E_p).
U.S. 41, Tamiami Trail – Miami, Florida

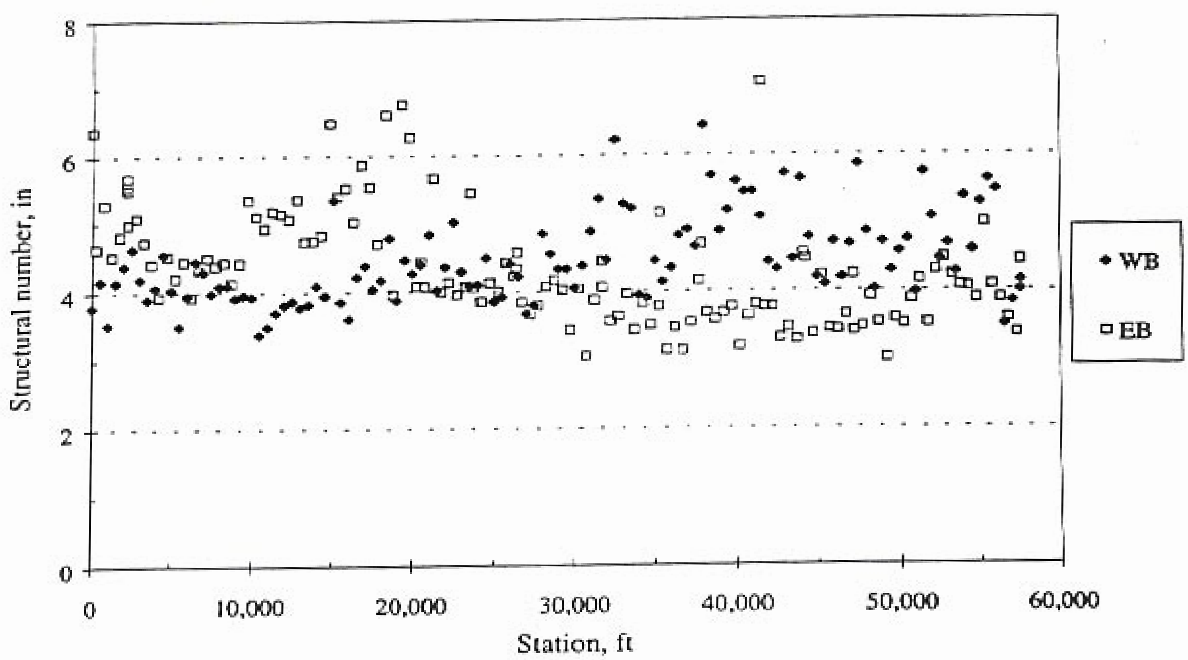


Figure 6. Effective structural number (SN_{eff}).
U.S. 41, Tamiami Trail – Miami, Florida

APPENDIX A

AC LAYER THICKNESSES FROM GPR USED FOR FWD ANALYSIS

Table A.1. AC Layer Thicknesses from GPR.
U.S. 41, Tamiami Trail - Miami, Florida.

Direction	Station (ft)	AC Thickness (in)	Direction	Station (ft)	AC Thickness (in)
Westbound	0	5.1	Eastbound	0	10.3
Westbound	500	7.4	Eastbound	250	7.5
Westbound	1,001	3.9	Eastbound	750	7.7
Westbound	1,500	6.3	Eastbound	1,250	7.0
Westbound	2,000	6.9	Eastbound	1,750	7.0
Westbound	2,500	7.4	Eastbound	2,176	8.4
Westbound	3,000	7.2	Eastbound	2,184	8.4
Westbound	3,500	6.0	Eastbound	2,191	8.2
Westbound	4,000	6.5	Eastbound	2,250	7.2
Westbound	4,500	6.2	Eastbound	2,750	6.7
Westbound	5,000	7.7	Eastbound	3,250	7.0
Westbound	5,500	5.3	Eastbound	3,750	7.5
Westbound	6,000	6.7	Eastbound	4,250	5.0
Westbound	6,500	7.5	Eastbound	4,750	6.5
Westbound	7,000	7.4	Eastbound	5,250	6.5
Westbound	7,500	7.4	Eastbound	5,750	6.7
Westbound	8,000	6.5	Eastbound	6,250	5.5
Westbound	8,500	7.5	Eastbound	6,750	6.9
Westbound	9,000	6.5	Eastbound	7,250	7.7
Westbound	9,500	6.9	Eastbound	7,750	7.5
Westbound	10,000	7.2	Eastbound	8,250	6.7
Westbound	10,500	4.8	Eastbound	8,750	6.2
Westbound	11,000	5.7	Eastbound	9,250	7.4
Westbound	11,500	5.5	Eastbound	9,750	9.6
Westbound	12,000	6.2	Eastbound	10,250	8.7
Westbound	12,500	6.9	Eastbound	10,750	8.7
Westbound	13,000	6.5	Eastbound	11,250	9.6
Westbound	13,500	6.2	Eastbound	11,750	9.3
Westbound	14,000	6.5	Eastbound	12,250	9.4
Westbound	14,500	6.3	Eastbound	12,750	8.7
Westbound	15,000	8.4	Eastbound	13,250	8.1
Westbound	15,500	6.0	Eastbound	13,750	8.6
Westbound	16,000	6.3	Eastbound	14,250	9.8
Westbound	16,500	6.7	Eastbound	14,750	9.3
Westbound	17,000	7.2	Eastbound	15,250	8.9
Westbound	17,500	6.5	Eastbound	15,750	10.3
Westbound	18,000	7.4	Eastbound	16,250	9.3
Westbound	18,500	7.2	Eastbound	16,750	9.8
Westbound	19,000	6.3	Eastbound	17,250	9.8
Westbound	19,500	6.9	Eastbound	17,750	8.9
Westbound	20,000	7.4	Eastbound	18,250	8.6
Westbound	20,500	6.5	Eastbound	18,750	7.9
Westbound	21,000	7.4	Eastbound	19,250	9.4
Westbound	21,500	6.5	Eastbound	19,751	9.4
Westbound	22,000	7.2	Eastbound	20,250	6.9
Westbound	22,500	7.4	Eastbound	20,508	5.5
Westbound	23,000	6.7	Eastbound	20,750	7.4
Westbound	23,500	6.5	Eastbound	21,250	9.8
Westbound	24,000	6.9	Eastbound	21,750	6.5
Westbound	24,500	7.0	Eastbound	22,250	7.2
Westbound	25,000	5.8	Eastbound	22,750	6.5
Westbound	25,500	6.2	Eastbound	23,250	6.5
Westbound	26,000	7.4	Eastbound	23,519	8.2
Westbound	26,500	6.7	Eastbound	23,750	7.0
Westbound	27,000	5.3	Eastbound	24,250	6.2
Westbound	27,500	6.2	Eastbound	24,750	6.7

Table A.1. AC Layer Thicknesses from GPR.
U.S. 41, Tamiami Trail - Miami, Florida.

Direction	Station (ft)	AC Thickness (in)
Westbound	28,000	4.8
Westbound	28,500	7.5
Westbound	29,000	6.7
Westbound	29,500	7.0
Westbound	30,000	7.0
Westbound	30,500	7.5
Westbound	31,000	8.6
Westbound	31,500	9.1
Westbound	32,000	7.9
Westbound	32,500	8.7
Westbound	33,000	8.7
Westbound	33,500	8.7
Westbound	34,000	6.7
Westbound	34,500	6.0
Westbound	35,000	7.0
Westbound	35,500	6.9
Westbound	36,000	7.2
Westbound	36,500	7.4
Westbound	37,000	8.1
Westbound	37,500	8.6
Westbound	38,000	8.2
Westbound	38,500	8.2
Westbound	39,000	8.4
Westbound	39,500	8.6
Westbound	40,000	8.7
Westbound	40,500	8.2
Westbound	41,000	8.2
Westbound	41,500	9.3
Westbound	42,000	7.7
Westbound	42,500	7.4
Westbound	43,000	8.7
Westbound	43,500	7.9
Westbound	44,000	8.6
Westbound	44,500	7.9
Westbound	45,000	7.4
Westbound	45,500	6.5
Westbound	46,000	6.9
Westbound	46,500	7.0
Westbound	47,000	7.4
Westbound	47,500	9.8
Westbound	48,000	7.2
Westbound	48,500	6.3
Westbound	49,000	8.1
Westbound	49,500	7.2
Westbound	50,000	8.1
Westbound	50,500	7.5
Westbound	51,000	6.5
Westbound	51,500	9.8
Westbound	52,000	7.9
Westbound	52,500	6.9
Westbound	53,000	7.2
Westbound	53,500	6.7
Westbound	54,000	8.1
Westbound	54,500	7.7
Westbound	55,000	8.4
Westbound	55,500	7.7

Direction	Station (ft)	AC Thickness (in)
Eastbound	25,249	6.0
Eastbound	25,750	7.7
Eastbound	26,250	6.7
Eastbound	26,417	4.8
Eastbound	26,426	5.1
Eastbound	26,750	6.7
Eastbound	27,250	5.8
Eastbound	27,748	5.8
Eastbound	28,250	6.5
Eastbound	28,750	5.5
Eastbound	29,250	5.7
Eastbound	29,750	5.1
Eastbound	30,250	4.8
Eastbound	30,750	3.3
Eastbound	31,250	4.6
Eastbound	31,728	5.7
Eastbound	31,750	5.5
Eastbound	32,250	3.6
Eastbound	32,750	4.5
Eastbound	33,250	5.3
Eastbound	33,750	3.9
Eastbound	34,249	5.0
Eastbound	34,750	4.1
Eastbound	35,250	4.6
Eastbound	35,296	6.5
Eastbound	35,750	3.1
Eastbound	36,250	5.0
Eastbound	36,750	3.4
Eastbound	37,250	3.6
Eastbound	37,750	6.2
Eastbound	37,886	5.7
Eastbound	38,248	5.7
Eastbound	38,750	4.3
Eastbound	39,250	5.1
Eastbound	39,750	5.3
Eastbound	40,250	3.3
Eastbound	40,750	3.9
Eastbound	41,250	5.1
Eastbound	41,555	7.9
Eastbound	41,750	6.2
Eastbound	42,250	5.5
Eastbound	42,750	3.6
Eastbound	43,250	3.9
Eastbound	43,750	3.9
Eastbound	44,144	5.8
Eastbound	44,250	7.7
Eastbound	44,750	3.4
Eastbound	45,250	6.9
Eastbound	45,750	3.4
Eastbound	46,250	4.3
Eastbound	46,750	6.0
Eastbound	47,191	4.8
Eastbound	47,250	4.3
Eastbound	47,750	5.5
Eastbound	48,250	6.7
Eastbound	48,750	4.3

Table A.1. AC Layer Thicknesses from GPR.
U.S. 41, Tamiami Trail - Miami, Florida.

Direction	Station (ft)	AC Thickness (in)
Westbound	56,000	7.7
Westbound	56,500	2.9
Westbound	57,000	3.1
Westbound	57,500	3.1
Westbound	57,523	3.1
Eastbound	49,250	3.4
Eastbound	49,750	4.8
Eastbound	50,250	6.0
Eastbound	50,750	6.3
Eastbound	51,245	7.0
Eastbound	51,750	5.1
Eastbound	52,250	7.4
Eastbound	52,750	7.2
Eastbound	53,250	6.3
Eastbound	53,750	6.2
Eastbound	54,250	5.5
Eastbound	54,750	4.3
Eastbound	55,250	5.0
Eastbound	55,750	5.7
Eastbound	56,250	3.8
Eastbound	56,750	2.7
Eastbound	57,250	2.7
Eastbound	57,500	3.3

APPENDIX B

FWD RESULTS

Table B.1. FWD Results
U.S. 41, Tamiami Trail - Miami, Florida.

General			Results			
Section N°	Station (ft)	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
Lane 1 (WB) Average:			11.1	6,176.7	121,844.6	4.1
Lane 1 (WB) STD:			2.5	3,946.0	47,100.6	0.6
Lane 2 (EB) Average:			10.0	7,473.5	147,101.3	4.3
Lane 2 (EB) STD:			2.6	3,979.3	60,016.4	0.8

GPR Core information (Thickness)	
WB Lane Average:	7.03
WB Lane STD:	1.26
EB Lane Average:	6.32
EB Lane STD:	1.89

Table B.1. FWD Results
U.S. 41, Tamiami Trail - Miami, Florida.

General			Results			
Section N°	Station (ft)	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
1	0	1	13.11	4,359	119,339	3.8
1	500	1	12.22	5,029	108,297	4.2
1	1001	1	13.69	4,310	119,737	3.5
1	1500	1	11.36	5,113	127,530	4.1
1	2000	1	11.33	4,547	136,712	4.4
1	2500	1	11.06	4,192	148,987	4.6
1	3000	1	10.47	6,936	114,079	4.2
1	3500	1	11.65	5,865	111,624	3.9
1	4000	1	11.82	5,184	116,511	4.1
1	4500	1	10.19	4,606	171,499	4.6
1	5000	1	14.23	4,173	94,142	4.0
1	5500	1	13.43	5,783	91,046	3.5
1	6000	1	12.41	5,395	103,247	3.9
1	6500	1	10.85	5,131	130,552	4.5
1	7000	1	10.74	6,001	119,300	4.3
1	7500	1	12.59	5,690	94,980	4.0
1	8000	1	11.28	5,652	118,498	4.1
1	8500	1	11.29	6,704	102,165	4.1
1	9000	1	13.33	4,556	104,068	3.9
1	9500	1	11.63	6,512	100,871	4.0
1	10000	1	13.82	4,584	94,507	3.9
1	10500	1	13.83	5,708	89,206	3.4
1	11000	1	15.85	4,244	84,058	3.5
1	11500	1	12.76	5,375	103,977	3.7
1	12000	1	12.43	5,744	100,731	3.8
1	12500	1	13.39	5,052	94,284	3.9
1	13000	1	12.59	6,123	93,462	3.8
1	13500	1	12.38	5,737	101,425	3.8
1	14000	1	10.11	7,380	118,872	4.1
1	14500	1	14.87	3,379	109,969	3.9
1	15000	1	6.95	7,967	197,298	5.3
1	15500	1	11.68	6,112	107,949	3.9
1	16000	1	14.64	4,984	84,007	3.6
1	16500	1	9.76	7,322	125,580	4.2
1	17000	1	8.98	8,373	130,192	4.4
1	17500	1	10.14	7,799	114,403	4.0
1	18000	1	10.65	7,045	109,156	4.2
1	18500	1	7.30	9,411	169,623	4.8
1	19000	1	11.29	6,858	104,596	3.9
1	19500	1	8.81	7,583	144,507	4.5
1	20000	1	10.42	6,688	116,816	4.3
1	20500	1	8.83	7,544	146,824	4.4
1	21000	1	7.63	8,342	169,493	4.8
1	21500	1	10.97	6,539	112,463	4.0
1	22000	1	9.12	8,247	128,194	4.4
1	22500	1	7.22	8,129	189,394	5.0
1	23000	1	10.22	6,072	132,404	4.3
1	23500	1	10.19	7,318	117,985	4.1
1	24000	1	11.14	6,213	111,683	4.1
1	24500	1	9.29	6,628	144,634	4.5
1	25000	1	11.67	5,942	111,168	3.9
1	25500	1	10.88	7,014	109,930	3.9
1	26000	1	9.81	6,779	127,871	4.4
1	26500	1	10.40	6,261	125,521	4.2
1	27000	1	13.24	4,906	105,305	3.7
1	27500	1	12.38	5,908	99,383	3.8
1	28000	1	7.04	6,958	261,793	4.8

Table B.1. FWD Results
U.S. 41, Tamiami Trail - Miami, Florida.

General			Results			
Section N°	Station (ft)	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
1	28500	1	9.01	7,393	138,530	4.5
1	29000	1	9.15	7,690	135,445	4.3
1	29500	1	9.58	7,265	129,018	4.3
1	30000	1	11.86	5,700	106,161	4.0
1	30500	1	9.94	6,901	123,367	4.4
2	31000	1	8.73	7,104	144,356	4.9
2	31500	1	6.97	8,842	178,527	5.3
2	32000	1	8.97	9,010	122,490	4.4
2	32500	1	4.98	9,874	296,450	6.2
2	33000	1	7.35	7,733	181,067	5.3
2	33500	1	7.16	8,780	174,010	5.2
2	34000	1	10.95	7,530	102,566	3.9
2	34500	1	10.90	6,953	111,098	3.9
2	35000	1	9.19	7,148	139,832	4.4
2	35500	1	10.58	6,846	114,243	4.1
2	36000	1	9.66	7,310	125,780	4.3
2	36500	1	7.95	7,789	165,683	4.8
2	37000	1	8.73	6,432	157,372	4.9
2	37500	1	10.08	6,168	124,960	4.6
2	38000	1	5.64	6,386	352,191	6.4
2	38500	1	5.34	11,248	244,579	5.7
2	39000	1	7.59	9,870	148,659	4.9
2	39500	1	7.17	8,876	172,808	5.2
2	40000	1	5.68	11,172	217,626	5.6
2	40500	1	5.54	12,556	214,494	5.4
2	41000	1	6.25	9,178	215,659	5.5
2	41500	1	7.93	8,470	147,989	5.1
2	42000	1	9.30	8,124	123,219	4.4
2	42500	1	9.28	8,746	119,560	4.3
2	43000	1	5.75	9,928	230,776	5.7
2	43500	1	9.24	8,277	122,509	4.4
2	44000	1	5.50	11,640	224,457	5.6
2	44500	1	8.21	8,083	150,432	4.8
2	45000	1	11.31	5,961	109,987	4.2
2	45500	1	10.04	7,615	117,756	4.1
2	46000	1	7.46	9,112	168,840	4.7
2	46500	1	9.60	8,462	116,809	4.2
2	47000	1	8.72	7,023	152,226	4.7
2	47500	1	6.62	7,505	211,615	5.8
2	48000	1	7.95	7,251	176,098	4.8
2	48500	1	11.20	6,055	115,139	4.0
2	49000	1	8.74	7,645	139,705	4.7
2	49500	1	10.20	6,745	121,162	4.3
2	50000	1	9.79	6,561	127,774	4.6
2	50500	1	8.25	7,682	156,629	4.7
2	51000	1	10.52	7,736	108,014	4.0
2	51500	1	6.23	9,608	198,716	5.7
2	52000	1	7.77	7,080	180,707	5.1
2	52500	1	9.52	6,398	142,894	4.4
2	53000	1	8.59	7,005	157,614	4.7
2	53500	1	9.96	6,698	129,055	4.3
2	54000	1	7.03	7,333	208,415	5.4
2	54500	1	8.45	8,765	137,467	4.6
2	55000	1	6.85	8,697	189,948	5.3
2	55500	1	4.95	13,062	255,148	5.6
2	56000	1	5.65	10,698	233,936	5.5
2	56500	1	9.17	9,108	140,999	3.5

Table B.1. FWD Results
U.S. 41, Tamiami Trail - Miami, Florida.

General			Results			
Section Nº	Station (ft)	Lane Nº	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
3	57000	1	4.52	40,040	179,435	3.8
3	57500	1	5.39	19,233	203,443	4.0
3	57523	1	4.74	22,772	225,107	4.1
4	0	2	6.93	5,205	254,415	6.4
4	250	2	11.56	3,825	147,975	4.6
4	750	2	8.95	4,367	211,592	5.3
4	1250	2	10.89	4,471	148,450	4.5
4	1750	2	10.59	3,866	178,651	4.8
4	2176	2	5.68	11,047	221,752	5.6
4	2184	2	5.72	9,811	237,303	5.7
4	2191	2	5.89	10,201	221,262	5.5
4	2250	2	9.13	4,780	192,571	5.0
4	2750	2	6.78	8,014	221,038	5.1
4	3250	2	9.77	4,848	169,357	4.7
4	3750	2	10.70	5,512	126,842	4.4
4	4250	2	11.16	5,368	135,409	3.9
4	4750	2	7.86	8,820	160,478	4.5
4	5250	2	10.25	6,300	129,292	4.2
4	5750	2	9.14	6,798	147,839	4.4
4	6250	2	11.40	5,492	124,499	3.9
4	6750	2	9.58	7,090	131,453	4.3
4	7250	2	9.97	6,195	130,847	4.5
4	7750	2	10.31	6,213	124,410	4.4
4	8250	2	10.51	4,996	146,646	4.4
4	8750	2	11.90	4,610	128,134	4.1
4	9250	2	10.54	5,552	130,218	4.4
5	9750	2	8.20	6,351	166,622	5.3
5	10250	2	10.47	3,891	164,648	5.1
5	10750	2	9.14	6,077	147,954	4.9
5	11250	2	9.29	5,392	151,211	5.2
5	11750	2	9.25	5,378	154,559	5.1
5	12250	2	8.59	7,032	145,186	5.1
5	12750	2	8.19	5,615	190,186	5.4
5	13250	2	9.61	5,806	143,416	4.7
5	13750	2	10.01	5,647	133,882	4.7
5	14250	2	11.22	4,770	118,825	4.8
5	14750	2	5.63	6,908	309,014	6.5
5	15250	2	7.41	7,066	188,991	5.4
5	15750	2	8.47	5,667	166,603	5.5
5	16250	2	11.06	3,914	143,731	5.0
5	16750	2	8.33	4,397	214,290	5.9
5	17250	2	7.91	6,146	180,188	5.5
5	17750	2	9.88	6,430	124,508	4.7
5	18250	2	5.40	6,629	361,385	6.6
5	18750	2	13.33	5,540	86,674	4.0
5	19250	2	5.10	7,478	345,071	6.8
5	19751	2	5.56	8,109	275,881	6.3
6	20250	2	11.23	6,166	110,837	4.1
6	20508	2	6.30	13,958	177,894	4.4
6	20750	2	11.41	6,593	101,683	4.1
6	21250	2	7.04	7,404	192,708	5.7
6	21750	2	11.14	6,424	110,892	4.0
6	22250	2	12.24	5,003	109,420	4.1
6	22750	2	12.24	5,357	107,369	4.0
6	23250	2	12.73	4,375	116,629	4.1
6	23519	2	5.27	14,223	215,304	5.4
6	23750	2	11.86	5,635	107,040	4.1

Table B.1. FWD Results
U.S. 41, Tamiami Trail - Miami, Florida.

General			Results			
Section N°	Station (ft)	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
6	24250	2	12.53	5,328	104,600	3.9
6	24750	2	10.72	6,386	117,900	4.1
6	25249	2	10.36	6,957	120,834	4.0
6	25750	2	9.59	7,462	123,653	4.4
6	26250	2	11.18	5,193	127,118	4.2
6	26417	2	5.90	15,682	187,774	4.3
6	26426	2	5.93	12,967	209,154	4.6
6	26750	2	13.41	4,979	95,634	3.8
6	27250	2	13.91	4,782	96,043	3.7
6	27748	2	11.50	6,550	106,518	3.8
6	28250	2	10.69	6,578	116,963	4.1
6	28750	2	9.54	6,660	147,263	4.2
6	29250	2	9.96	7,185	128,240	4.0
7	29750	2	13.42	6,091	88,691	3.4
7	30250	2	9.32	7,030	152,227	4.0
7	30750	2	14.65	5,631	87,181	3.1
7	31250	2	9.36	7,910	139,026	3.9
7	31728	2	8.84	6,404	172,521	4.4
7	31750	2	8.89	8,713	136,863	4.1
7	32250	2	10.35	7,260	130,751	3.6
7	32750	2	10.77	7,230	117,290	3.6
7	33250	2	10.15	6,767	131,646	4.0
7	33750	2	12.03	6,267	110,487	3.4
7	34249	2	11.05	6,052	125,012	3.8
7	34750	2	11.33	6,921	112,918	3.5
7	35250	2	10.37	6,872	129,445	3.8
7	35296	2	5.31	13,246	234,991	5.1
7	35750	2	13.89	5,552	98,061	3.1
7	36250	2	13.22	5,958	92,883	3.5
7	36750	2	13.97	5,815	92,071	3.1
7	37250	2	10.77	6,815	128,156	3.5
7	37750	2	9.34	8,022	129,722	4.1
7	37886	2	5.62	15,074	202,878	4.7
7	38248	2	11.61	7,225	98,757	3.7
7	38750	2	10.71	7,478	116,469	3.6
7	39250	2	10.90	7,475	109,404	3.7
7	39750	2	10.65	7,429	113,355	3.8
7	40250	2	12.58	6,779	99,031	3.2
7	40750	2	10.10	7,544	130,844	3.6
7	41250	2	10.95	6,440	120,727	3.8
7	41555	2	3.91	9,701	491,589	7.1
7	41750	2	12.69	5,711	97,592	3.8
7	42250	2	11.30	6,677	109,563	3.8
7	42750	2	12.09	6,810	104,365	3.3
7	43250	2	12.03	6,084	113,128	3.5
7	43750	2	11.96	7,609	96,931	3.3
7	44144	2	7.10	9,848	181,808	4.5
7	44250	2	9.15	7,990	127,951	4.5
7	44750	2	12.28	5,893	115,023	3.4
7	45250	2	9.76	7,554	122,323	4.2
7	45750	2	11.00	6,968	122,569	3.4
7	46250	2	12.31	6,475	101,708	3.4
7	46750	2	13.23	5,778	91,052	3.6
7	47191	2	7.76	8,964	174,664	4.2
7	47250	2	12.92	5,909	100,091	3.4
7	47750	2	14.60	5,119	85,257	3.5
7	48250	2	13.70	4,446	100,267	3.9

Table B.1. FWD Results
U.S. 41, Tamiami Trail - Miami, Florida.

General			Results			
Section N°	Station (ft)	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
7	48750	2	12.18	5,908	110,914	3.5
7	49250	2	17.17	4,242	81,760	3.0
7	49750	2	12.22	6,000	106,520	3.6
7	50250	2	14.50	5,482	80,977	3.5
7	50750	2	12.63	5,265	103,702	3.9
7	51245	2	11.10	6,001	114,544	4.2
7	51750	2	11.76	7,606	95,554	3.5
7	52250	2	10.42	6,533	118,539	4.3
7	52750	2	8.72	8,178	138,221	4.5
7	53250	2	9.50	7,274	134,179	4.2
7	53750	2	10.45	6,622	122,240	4.1
7	54250	2	8.53	9,800	135,445	4.0
7	54750	2	8.78	8,639	147,786	3.9
7	55250	2	4.22	20,159	275,709	5.0
7	55750	2	8.21	10,961	133,661	4.1
8	56250	2	6.50	16,330	162,209	3.9
8	56750	2	5.24	32,337	160,192	3.6
8	57250	2	6.91	20,689	132,324	3.4
8	57500	2	4.01	26,517	266,673	4.4

Tamiami Trail Alternatives Study
Modified FWD Data

Section N Job Stati	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
10th Percentile		12.99	9,871	214,818	5.4
90th Percentile		5.83	4,883	98,922	3.5
95th Percentile		5.39	4,381	93,056	3.4
Average		9.82	7,556	145,367	4.4
STD		2.54	3,957	54,206	0.7
Max		17.17	40,040	491,589	7.1
Min		3.91	3,379	80,977	3.0
Average + 2 STD		14.89	15,469	253,779	5.8
Average - 2 STD		4.75	-357	36,955	2.9
Average + 1 STD		12.36	11,513	199,573	5.1
Average - 1 STD		7.28	3,600	91,161	3.6

Tamiami Trail Alternatives Study
Modified FWD Data

Section N	Job Stati	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
3	729+50	1 (WB)	4.74	22,772	225,107	4.1
3	729+73	1 (WB)	5.39	19,233	203,443	4.0
3	734+73	1 (WB)	4.52	40,040	179,435	3.8
2	739+73	1 (WB)	9.17	9,108	140,999	3.5
2	744+73	1 (WB)	5.65	10,698	233,936	5.5
2	751+00	1 (WB)	4.95	13,062	255,148	5.6
2	756+00	1 (WB)	6.85	8,697	189,948	5.3
2	761+00	1 (WB)	8.45	8,765	137,467	4.6
2	766+00	1 (WB)	7.03	7,333	208,415	5.4
2	771+00	1 (WB)	9.96	6,698	129,055	4.3
2	776+00	1 (WB)	8.59	7,005	157,614	4.7
2	781+00	1 (WB)	9.52	6,398	142,894	4.4
2	786+00	1 (WB)	7.77	7,080	180,707	5.1
2	791+00	1 (WB)	6.23	9,608	198,716	5.7
2	796+00	1 (WB)	10.52	7,736	108,014	4.0
2	801+00	1 (WB)	8.25	7,682	156,629	4.7
2	806+00	1 (WB)	9.79	6,561	127,774	4.6
2	811+00	1 (WB)	10.20	6,745	121,162	4.3
2	816+00	1 (WB)	8.74	7,645	139,705	4.7
2	821+00	1 (WB)	11.20	6,055	115,139	4.0
2	826+00	1 (WB)	7.95	7,251	176,098	4.8
2	831+00	1 (WB)	6.62	7,505	211,615	5.8
2	836+00	1 (WB)	8.72	7,023	152,226	4.7
2	841+00	1 (WB)	9.60	8,462	116,809	4.2
2	846+00	1 (WB)	7.46	9,112	168,840	4.7
2	851+00	1 (WB)	10.04	7,615	117,756	4.1
2	856+00	1 (WB)	11.31	5,961	109,987	4.2
2	861+00	1 (WB)	8.21	8,083	150,432	4.8
2	866+00	1 (WB)	5.50	11,640	224,457	5.6
2	871+00	1 (WB)	9.24	8,277	122,509	4.4
2	876+00	1 (WB)	5.75	9,928	230,776	5.7
2	881+00	1 (WB)	9.28	8,746	119,560	4.3
2	886+00	1 (WB)	9.30	8,124	123,219	4.4
2	891+00	1 (WB)	7.93	8,470	147,989	5.1
2	896+00	1 (WB)	6.25	9,178	215,659	5.5
2	901+00	1 (WB)	5.54	12,556	214,494	5.4
2	906+00	1 (WB)	5.68	11,172	217,626	5.6
2	911+00	1 (WB)	7.17	8,876	172,808	5.2
2	916+00	1 (WB)	7.59	9,870	148,659	4.9
2	921+00	1 (WB)	5.34	11,248	244,579	5.7
2	926+00	1 (WB)	5.64	6,386	352,191	6.4
2	931+00	1 (WB)	10.08	6,168	124,960	4.6
2	936+00	1 (WB)	8.73	6,432	157,372	4.9
2	941+00	1 (WB)	7.95	7,789	165,683	4.8
2	946+00	1 (WB)	9.66	7,310	125,780	4.3
2	951+00	1 (WB)	10.58	6,846	114,243	4.1
2	956+00	1 (WB)	9.19	7,148	139,832	4.4
2	961+00	1 (WB)	10.90	6,953	111,098	3.9

Tamiami Trail Alternatives Study
Modified FWD Data

Section N	Job Stati	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
2	966+00	1 (WB)	10.95	7,530	102,566	3.9
2	971+00	1 (WB)	7.16	8,780	174,010	5.2
2	976+00	1 (WB)	7.35	7,733	181,067	5.3
2	981+00	1 (WB)	4.98	9,874	296,450	6.2
2	986+00	1 (WB)	8.97	9,010	122,490	4.4
2	991+00	1 (WB)	6.97	8,842	178,527	5.3
2	996+00	1 (WB)	8.73	7,104	144,356	4.9
1	1001+00	1 (WB)	9.94	6,901	123,367	4.4
1	1006+00	1 (WB)	11.86	5,700	106,161	4.0
1	1011+00	1 (WB)	9.58	7,265	129,018	4.3
1	1016+00	1 (WB)	9.15	7,690	135,445	4.3
1	1021+00	1 (WB)	9.01	7,393	138,530	4.5
1	1026+00	1 (WB)	7.04	6,958	261,793	4.8
1	1031+00	1 (WB)	12.38	5,908	99,383	3.8
1	1036+00	1 (WB)	13.24	4,906	105,305	3.7
1	1041+00	1 (WB)	10.40	6,261	125,521	4.2
1	1046+00	1 (WB)	9.81	6,779	127,871	4.4
1	1051+00	1 (WB)	10.88	7,014	109,930	3.9
1	1056+00	1 (WB)	11.67	5,942	111,168	3.9
1	1061+00	1 (WB)	9.29	6,628	144,634	4.5
1	1066+00	1 (WB)	11.14	6,213	111,683	4.1
1	1071+00	1 (WB)	10.19	7,318	117,985	4.1
1	1076+00	1 (WB)	10.22	6,072	132,404	4.3
1	1081+00	1 (WB)	7.22	8,129	189,394	5.0
1	1086+00	1 (WB)	9.12	8,247	128,194	4.4
1	1091+00	1 (WB)	10.97	6,539	112,463	4.0
1	1096+00	1 (WB)	7.63	8,342	169,493	4.8
1	1101+00	1 (WB)	8.83	7,544	146,824	4.4
1	1106+00	1 (WB)	10.42	6,688	116,816	4.3
1	1111+00	1 (WB)	8.81	7,583	144,507	4.5
1	1116+00	1 (WB)	11.29	6,858	104,596	3.9
1	1121+00	1 (WB)	7.30	9,411	169,623	4.8
1	1126+00	1 (WB)	10.65	7,045	109,156	4.2
1	1131+00	1 (WB)	10.14	7,799	114,403	4.0
1	1136+00	1 (WB)	8.98	8,373	130,192	4.4
1	1141+00	1 (WB)	9.76	7,322	125,580	4.2
1	1146+00	1 (WB)	14.64	4,984	84,007	3.6
1	1151+00	1 (WB)	11.68	6,112	107,949	3.9
1	1156+00	1 (WB)	6.95	7,967	197,298	5.3
1	1161+00	1 (WB)	14.87	3,379	109,969	3.9
1	1166+00	1 (WB)	10.11	7,380	118,872	4.1
1	1171+00	1 (WB)	12.38	5,737	101,425	3.8
1	1176+00	1 (WB)	12.59	6,123	93,462	3.8
1	1181+00	1 (WB)	13.39	5,052	94,284	3.9
1	1186+00	1 (WB)	12.43	5,744	100,731	3.8
1	1191+00	1 (WB)	12.76	5,375	103,977	3.7
1	1196+00	1 (WB)	15.85	4,244	84,058	3.5
1	1201+00	1 (WB)	13.83	5,708	89,206	3.4

Tamiami Trail Alternatives Study
Modified FWD Data

Section N	Job Stati	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
1	1206+00	1 (WB)	13.82	4,584	94,507	3.9
1	1211+00	1 (WB)	11.63	6,512	100,871	4.0
1	1216+00	1 (WB)	13.33	4,556	104,068	3.9
1	1221+00	1 (WB)	11.29	6,704	102,165	4.1
1	1226+00	1 (WB)	11.28	5,652	118,498	4.1
1	1231+00	1 (WB)	12.59	5,690	94,980	4.0
1	1236+00	1 (WB)	10.74	6,001	119,300	4.3
1	1241+00	1 (WB)	10.85	5,131	130,552	4.5
1	1246+00	1 (WB)	12.41	5,395	103,247	3.9
1	1251+00	1 (WB)	13.43	5,783	91,046	3.5
1	1256+00	1 (WB)	14.23	4,173	94,142	4.0
1	1261+00	1 (WB)	10.19	4,606	171,499	4.6
1	1266+00	1 (WB)	11.82	5,184	116,511	4.1
1	1271+00	1 (WB)	11.65	5,865	111,624	3.9
1	1276+00	1 (WB)	10.47	6,936	114,079	4.2
1	1281+00	1 (WB)	11.06	4,192	148,987	4.6
1	1286+00	1 (WB)	11.33	4,547	136,712	4.4
1	1291+00	1 (WB)	11.36	5,113	127,530	4.1
1	1295+99	1 (WB)	13.69	4,310	119,737	3.5
1	1301+00	1 (WB)	12.22	5,029	108,297	4.2
1	1306+00	1 (WB)	13.11	4,359	119,339	3.8
8	729+73	2 (EB)	4.01	26,517	266,673	4.4
8	732+23	2 (EB)	6.91	20,689	132,324	3.4
8	737+23	2 (EB)	5.24	32,337	160,192	3.6
8	742+23	2 (EB)	6.50	16,330	162,209	3.9
7	748+50	2 (EB)	8.21	10,961	133,661	4.1
7	753+50	2 (EB)	4.22	20,159	275,709	5.0
7	758+50	2 (EB)	8.78	8,639	147,786	3.9
7	763+50	2 (EB)	8.53	9,800	135,445	4.0
7	768+50	2 (EB)	10.45	6,622	122,240	4.1
7	773+50	2 (EB)	9.50	7,274	134,179	4.2
7	778+50	2 (EB)	8.72	8,178	138,221	4.5
7	783+50	2 (EB)	10.42	6,533	118,539	4.3
7	788+50	2 (EB)	11.76	7,606	95,554	3.5
7	793+55	2 (EB)	11.10	6,001	114,544	4.2
7	798+50	2 (EB)	12.63	5,265	103,702	3.9
7	803+50	2 (EB)	14.50	5,482	80,977	3.5
7	808+50	2 (EB)	12.22	6,000	106,520	3.6
7	813+50	2 (EB)	17.17	4,242	81,760	3.0
7	818+50	2 (EB)	12.18	5,908	110,914	3.5
7	823+50	2 (EB)	13.70	4,446	100,267	3.9
7	828+50	2 (EB)	14.60	5,119	85,257	3.5
7	833+50	2 (EB)	12.92	5,909	100,091	3.4
7	834+09	2 (EB)	7.76	8,964	174,664	4.2
7	838+50	2 (EB)	13.23	5,778	91,052	3.6
7	843+50	2 (EB)	12.31	6,475	101,708	3.4
7	848+50	2 (EB)	11.00	6,968	122,569	3.4

Tamiami Trail Alternatives Study
Modified FWD Data

Section N	Job Stati	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
7	853+50	2 (EB)	9.76	7,554	122,323	4.2
7	858+50	2 (EB)	12.28	5,893	115,023	3.4
7	863+50	2 (EB)	9.15	7,990	127,951	4.5
7	864+56	2 (EB)	7.10	9,848	181,808	4.5
7	868+50	2 (EB)	11.96	7,609	96,931	3.3
7	873+50	2 (EB)	12.03	6,084	113,128	3.5
7	878+50	2 (EB)	12.09	6,810	104,365	3.3
7	883+50	2 (EB)	11.30	6,677	109,563	3.8
7	888+50	2 (EB)	12.69	5,711	97,592	3.8
7	890+45	2 (EB)	3.91	9,701	491,589	7.1
7	893+50	2 (EB)	10.95	6,440	120,727	3.8
7	898+50	2 (EB)	10.10	7,544	130,844	3.6
7	903+50	2 (EB)	12.58	6,779	99,031	3.2
7	908+50	2 (EB)	10.65	7,429	113,355	3.8
7	913+50	2 (EB)	10.90	7,475	109,404	3.7
7	918+50	2 (EB)	10.71	7,478	116,469	3.6
7	923+52	2 (EB)	11.61	7,225	98,757	3.7
7	927+14	2 (EB)	5.62	15,074	202,878	4.7
7	928+50	2 (EB)	9.34	8,022	129,722	4.1
7	933+50	2 (EB)	10.77	6,815	128,156	3.5
7	938+50	2 (EB)	13.97	5,815	92,071	3.1
7	943+50	2 (EB)	13.22	5,958	92,883	3.5
7	948+50	2 (EB)	13.89	5,552	98,061	3.1
7	953+04	2 (EB)	5.31	13,246	234,991	5.1
7	953+50	2 (EB)	10.37	6,872	129,445	3.8
7	958+50	2 (EB)	11.33	6,921	112,918	3.5
7	963+51	2 (EB)	11.05	6,052	125,012	3.8
7	968+50	2 (EB)	12.03	6,267	110,487	3.4
7	973+50	2 (EB)	10.15	6,767	131,646	4.0
7	978+50	2 (EB)	10.77	7,230	117,290	3.6
7	983+50	2 (EB)	10.35	7,260	130,751	3.6
7	988+50	2 (EB)	8.89	8,713	136,863	4.1
7	988+72	2 (EB)	8.84	6,404	172,521	4.4
7	993+50	2 (EB)	9.36	7,910	139,026	3.9
7	998+50	2 (EB)	14.65	5,631	87,181	3.1
7	1003+50	2 (EB)	9.32	7,030	152,227	4.0
7	1008+50	2 (EB)	13.42	6,091	88,691	3.4
6	1013+50	2 (EB)	9.96	7,185	128,240	4.0
6	1018+50	2 (EB)	9.54	6,660	147,263	4.2
6	1023+50	2 (EB)	10.69	6,578	116,963	4.1
6	1028+52	2 (EB)	11.50	6,550	106,518	3.8
6	1033+50	2 (EB)	13.91	4,782	96,043	3.7
6	1038+50	2 (EB)	13.41	4,979	95,634	3.8
6	1041+74	2 (EB)	5.93	12,967	209,154	4.6
6	1041+83	2 (EB)	5.90	15,682	187,774	4.3
6	1043+50	2 (EB)	11.18	5,193	127,118	4.2
6	1048+50	2 (EB)	9.59	7,462	123,653	4.4
6	1053+51	2 (EB)	10.36	6,957	120,834	4.0

Tamiami Trail Alternatives Study
Modified FWD Data

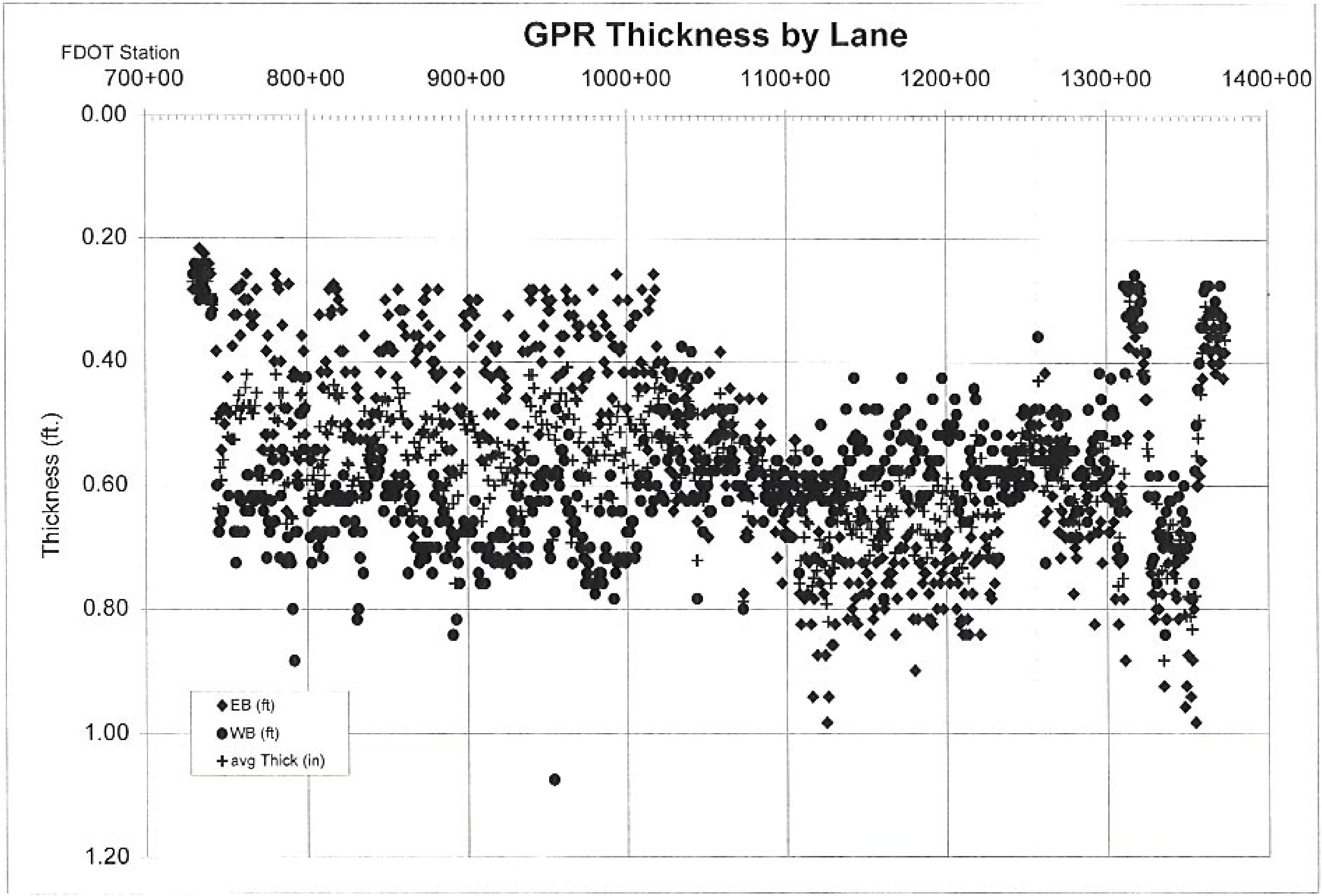
Section N	Job Stati	Lane N°	D0n (mils)	Mr (psi)	Ep (psi)	SNeff (in)
6	1058+50	2 (EB)	10.72	6,386	117,900	4.1
6	1063+50	2 (EB)	12.53	5,328	104,600	3.9
6	1068+50	2 (EB)	11.86	5,635	107,040	4.1
6	1070+81	2 (EB)	5.27	14,223	215,304	5.4
6	1073+50	2 (EB)	12.73	4,375	116,629	4.1
6	1078+50	2 (EB)	12.24	5,357	107,369	4.0
6	1083+50	2 (EB)	12.24	5,003	109,420	4.1
6	1088+50	2 (EB)	11.14	6,424	110,892	4.0
6	1093+50	2 (EB)	7.04	7,404	192,708	5.7
6	1098+50	2 (EB)	11.41	6,593	101,683	4.1
6	1100+92	2 (EB)	6.30	13,958	177,894	4.4
6	1103+50	2 (EB)	11.23	6,166	110,837	4.1
5	1108+49	2 (EB)	5.56	8,109	275,881	6.3
5	1113+50	2 (EB)	5.10	7,478	345,071	6.8
5	1118+50	2 (EB)	13.33	5,540	86,674	4.0
5	1123+50	2 (EB)	5.40	6,629	361,385	6.6
5	1128+50	2 (EB)	9.88	6,430	124,508	4.7
5	1133+50	2 (EB)	7.91	6,146	180,188	5.5
5	1138+50	2 (EB)	8.33	4,397	214,290	5.9
5	1143+50	2 (EB)	11.06	3,914	143,731	5.0
5	1148+50	2 (EB)	8.47	5,667	166,603	5.5
5	1153+50	2 (EB)	7.41	7,066	188,991	5.4
5	1158+50	2 (EB)	5.63	6,908	309,014	6.5
5	1163+50	2 (EB)	11.22	4,770	118,825	4.8
5	1168+50	2 (EB)	10.01	5,647	133,882	4.7
5	1173+50	2 (EB)	9.61	5,806	143,416	4.7
5	1178+50	2 (EB)	8.19	5,615	190,186	5.4
5	1183+50	2 (EB)	8.59	7,032	145,186	5.1
5	1188+50	2 (EB)	9.25	5,378	154,559	5.1
5	1193+50	2 (EB)	9.29	5,392	151,211	5.2
5	1198+50	2 (EB)	9.14	6,077	147,954	4.9
5	1203+50	2 (EB)	10.47	3,891	164,648	5.1
5	1208+50	2 (EB)	8.20	6,351	166,622	5.3
4	1213+50	2 (EB)	10.54	5,552	130,218	4.4
4	1218+50	2 (EB)	11.90	4,610	128,134	4.1
4	1223+50	2 (EB)	10.51	4,996	146,646	4.4
4	1228+50	2 (EB)	10.31	6,213	124,410	4.4
4	1233+50	2 (EB)	9.97	6,195	130,847	4.5
4	1238+50	2 (EB)	9.58	7,090	131,453	4.3
4	1243+50	2 (EB)	11.40	5,492	124,499	3.9
4	1248+50	2 (EB)	9.14	6,798	147,839	4.4
4	1253+50	2 (EB)	10.25	6,300	129,292	4.2
4	1258+50	2 (EB)	7.86	8,820	160,478	4.5
4	1263+50	2 (EB)	11.16	5,368	135,409	3.9
4	1268+50	2 (EB)	10.70	5,512	126,842	4.4
4	1273+50	2 (EB)	9.77	4,848	169,357	4.7
4	1278+50	2 (EB)	6.78	8,014	221,038	5.1
4	1283+50	2 (EB)	9.13	4,780	192,571	5.0

Tamiami Trail Alternatives Study
Modified FWD Data

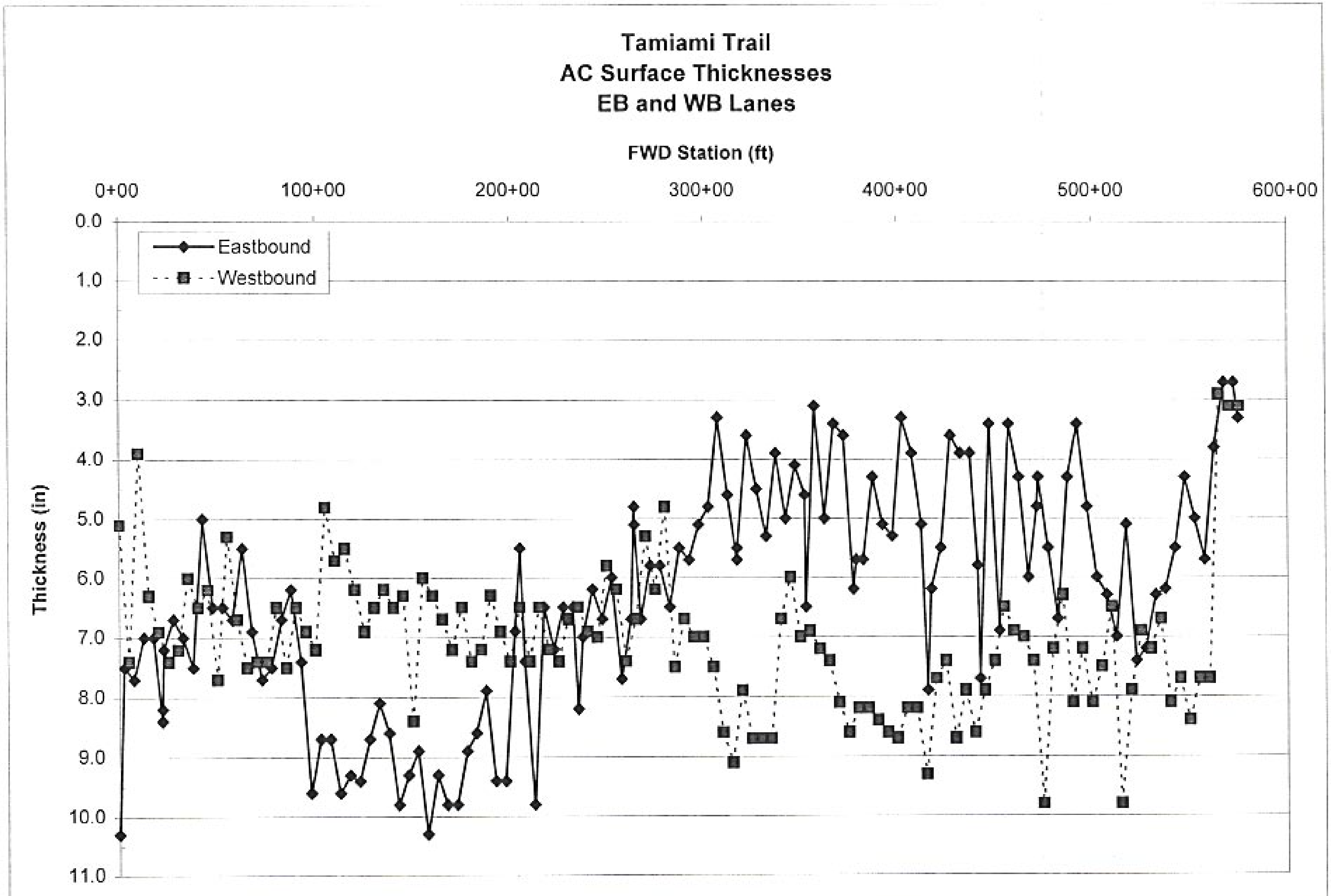
Section N	Station (ft	Job Stati	Lane N°	D0n (mils	Mr (psi)	Ep (psi)	SNeff (in)	Core
1	2500	1281+00	1 (WB)	11.06	4,192	148,987	4.6	DCB5
4	2750	1278+50	2 (EB)	6.78	8,014	221,038	5.1	DCB5
1	10500	1201+00	1 (WB)	13.83	5,708	89,206	3.4	DCB20
5	10750	1198+50	2 (EB)	9.14	6,077	147,954	4.9	DCB20
1	13500	1171+00	1 (WB)	12.38	5,737	101,425	3.8	CB 25
5	13250	1173+50	2 (EB)	9.61	5,806	143,416	4.7	CB25
1	21000	1096+00	1 (WB)	7.63	8,342	169,493	4.8	DCB40
6	21250	1093+50	2 (EB)	7.04	7,404	192,708	5.7	DCB40
2	32000	986+00	1 (WB)	8.97	9,010	122,490	4.4	CB60
7	32250	983+50	2 (EB)	10.35	7,260	130,751	3.6	CB60
2	35000	956+00	1 (WB)	9.19	7,148	139,832	4.4	DCB65
7	34750	958+50	2 (EB)	11.33	6,921	112,918	3.5	DCB65
2	43000	876+00	1 (WB)	5.75	9,928	230,776	5.7	CB80
7	42750	878+50	2 (EB)	12.09	6,810	104,365	3.3	CB80
2	45500	851+00	1 (WB)	10.04	7,615	117,756	4.1	DCB85
7	45750	848+50	2 (EB)	11.00	6,968	122,569	3.4	DCB85
2	53500	771+00	1 (WB)	9.96	6,698	129,055	4.3	DCB1006
7	53250	773+50	2 (EB)	9.50	7,274	134,179	4.2	DCB1006
2	56500	739+73	1 (WB)	9.17	9,108	140,999	3.5	CB106
8	56750	737+23	2 (EB)	5.24	32,337	160,192	3.6	CB106

Appendix C-3 - IMS GPR and Distress Data

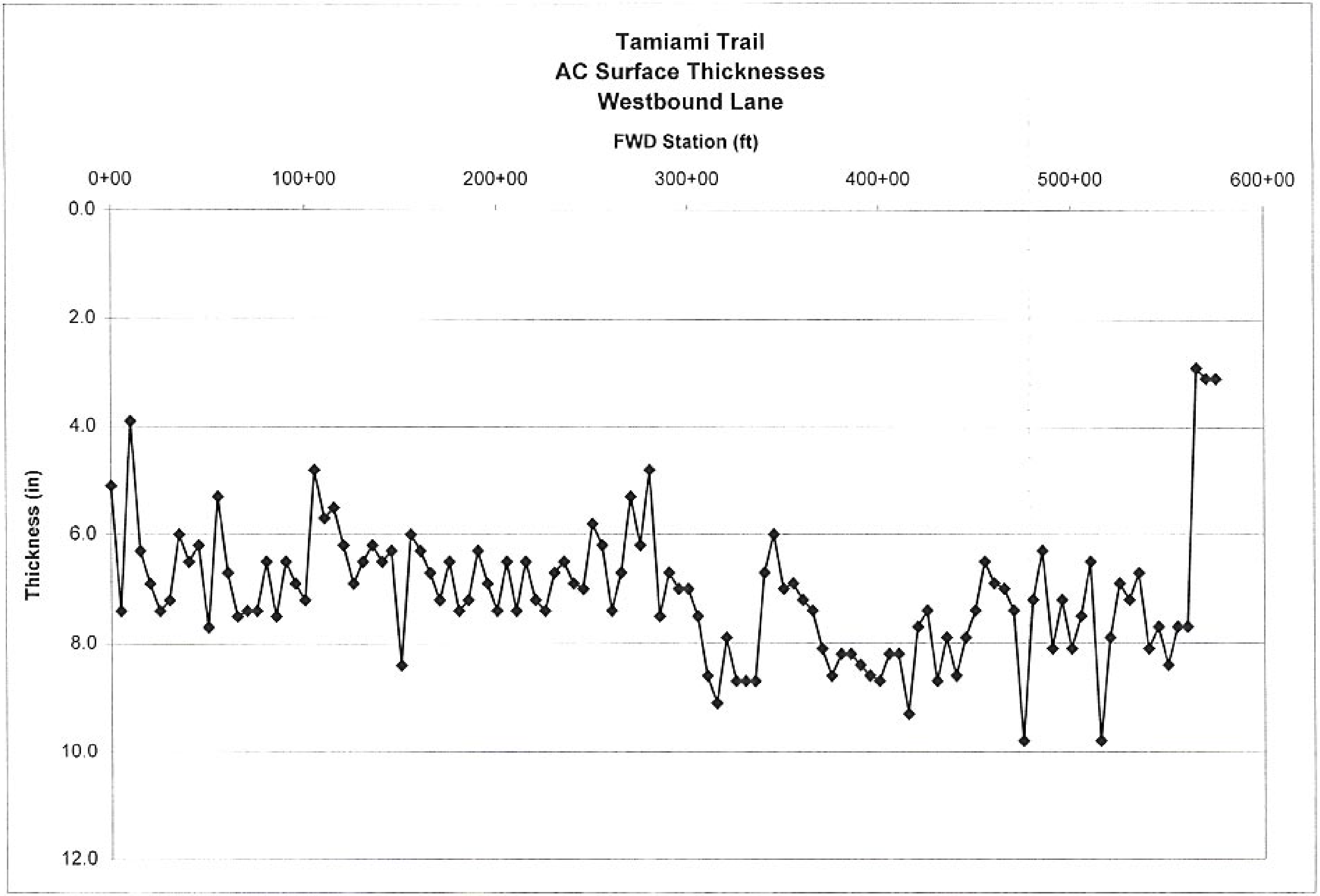
1. GPR Thickness Data
2. IMS Distress Data
3. Centerline, Levee and Canal Elevations

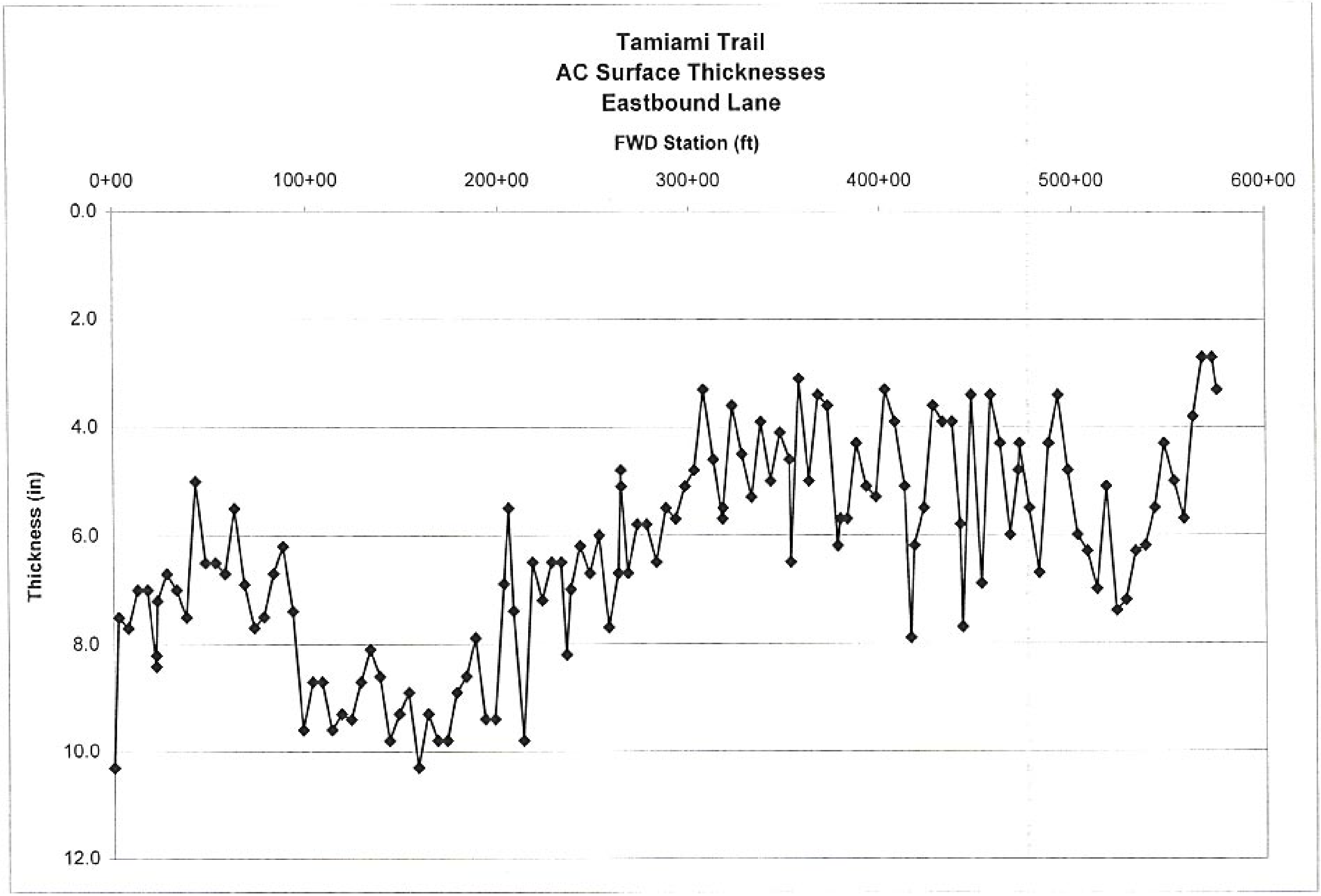


GPR Thickness by Lane
FDOT Station
700+00
800+00
900+00
1000+00
1100+00
1200+00
1300+00
1400+00
Thickness (ft.)
0.00
0.20
0.40
0.60
0.80
1.00
1.20
EB (ft)
WB (ft)
avg Thick (in)



Tamiami Trail
AC Surface Thicknesses
EB and WB Lanes
FWD Station (ft)
0+00
100+00
200+00
300+00
400+00
500+00
600+00
Thickness (in)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
Eastbound
Westbound


Tamiami Trail
AC Surface Thicknesses
Westbound Lane
FWD Station (ft)
0+00
100+00
200+00
300+00
400+00
500+00
600+00
Thickness (in)
0.0
2.0
4.0
6.0
8.0
10.0
12.0


Tamiami Trail
AC Surface Thicknesses
Eastbound Lane
FWD Station (ft)
0+00
100+00
200+00
300+00
400+00
500+00
600+00
Thickness (in)
0.0
2.0
4.0
6.0
8.0
10.0
12.0

Jansen, Mark C.

From: Butler, Dave [dbutler@terracon.com]
Sent: Tuesday, November 21, 2000 9:25 AM
To: Jansen, Mark C.
Subject: RE: Tamiami Trail Testing/Report

Tamiami Trail Surface Data.xls...

<<Tamiami Trail Surface Data.xls>>

Here is the surface data with the IRI data in both wheel paths. To convert to metric (mm/m), divide by 63.36.

If you can't read the attachment, call me.

-----Original Message-----

From: **Jansen, Mark C. [mailto:MCJansen@pbsj.com]**
Sent: Monday, November 20, 2000 6:53 AM
To: 'Butler, Dave'
Subject: RE: Tamiami Trail Testing/Report

Dave:

We are interested in including the IRI data for both wheelpaths in the 75% report to the Corps of Engineers. The draft of this report needs to go out on Wednesday. Can you let me know the possibility of inclusion of this data by then? I will be in all day.

Thank you,
Mark

Mark C. Jansen, P.E.
Project Engineer
PBS&J - Winter Park
407-647-7275 x361

-----Original Message-----

From: **Butler, Dave [mailto:dbutler@terracon.com]**
Sent: Friday, November 17, 2000 5:45 PM
To: Jansen, Mark C.
Subject: RE: Tamiami Trail Testing/Report

We have both left and right IRI data. It will take ½ day of effort to process and check this data. If you are interested, I will pursue it.
I will be in the office after 2:00 p.m. on Monday.

-----Original Message-----

From: **Jansen, Mark C.** [mailto:MCJansen@pbsj.com]
Sent: Friday, November 17, 2000 10:04 AM
To: 'Butler, Dave'
Cc: Paul Foxworthy (E-mail)

HEADING	DEFINITION	COMMENT
RSTNUM	Number of each 1/70th mile section	
Object	Number of each 1/10th mile section	
Direction	Direction of travel during test	
Beg Station	Beginning station of test section	
End Station	Ending station of test section	
AREA(ft^2)	Area of test section in FT^2	
All-NWP-II	Area of alligator cracking class II non-wheel path in FT^2	
All-NWP-III	Area of alligator cracking class III non-wheel path in FT^2	
All-NWP-S	Area of alligator cracking class sealed non-wheel path in FT^2	There were no sealed cracks
All-WP-II	Area of alligator cracking class II wheel path in FT^2	
All-WP-III	Area of alligator cracking class III wheel path in FT^2	
All-WP-S	Area of alligator cracking class sealed wheel path in FT^2	There were no sealed cracks
BLK-IB	Area of block cracking class IB in FT^2	There was no significant block cracking
BLK-II	Area of block cracking class II in FT^2	There was no significant block cracking
BLK-III	Area of block cracking class III in FT^2	There was no significant block cracking
LONG-IB	Area of longitudinal cracking class IB in FT^2	
LONG-II	Area of longitudinal cracking class II in FT^2	
LONG-III	Area of longitudinal cracking class III in FT^2	
LONG-S	Area of longitudinal cracking class sealed in FT^2	There were no sealed cracks
RAVEL-L	Area of raveling low severity in FT^2	There was no significant raveling
RAVEL-M	Area of raveling medium severity in FT^2	There was no significant raveling
RAVEL-H	Area of raveling high severity in FT^2	There was no significant raveling
%CL-IB	Percent of class IB distress	
%CL-II	Percent of class II distress	
%CL-III	Percent of class III distress	
rut_ful_ln	Rut depth in inches for the full lane width	
rut_rght	Rut depth in inches for the right wheel path	
rut_left	Rut depth in inches for the left wheel path	

Tamiami Trail Surface Distress Data - 1/10 Mile Summary
From Infrastructure Management Systems

Object	Direction	Beg Sta	End Sta	Begin Station	End Station	AREA(ft2)	All-NWP-II	All-NWP-III	All-NWP-S	All-WP-II	All-WP-III	All-WP-S	BLK-IB	BLK-II	BLK-III	LONG-IB	LONG-II	LONG-III	LONG-S	RAVEL-L	RAVEL-M	RAVEL-H	%CL-IB	%CL-II	%CL-III	rut_ful_ln	rut_rght	rut_left	IRI_r	RideIndex_r	IRI_l	RideIndex_l
352 Total	wb	0	528	1306+00	1300+72	6335	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0	0	0.46%	0.00%	0.00%	0.15	0.11	0.14	72.1	8.8	65.2	9.0
353 Total	wb	528	1056	1300+72	1295+44	6335	0	0	0	0	0	0	0	0	0	100	184	0	0	0	0	0	1.58%	2.90%	0.00%	0.18	0.10	0.18	54.3	9.1	68.8	8.9
354 Total	wb	1056	1584	1295+44	1290+16	6335	33	0	0	201	0	0	0	0	0	23	339	0	0	0	0	0	0.36%	9.52%	0.00%	0.24	0.22	0.18	82.3	8.7	100.2	8.4
355 Total	wb	1584	2112	1290+16	1284+88	6335	174	0	0	494	0	0	0	0	0	253	741	0	0	0	0	0	3.99%	22.24%	0.00%	0.20	0.17	0.15	93.7	8.5	107.4	8.3
356 Total	wb	2112	2640	1284+88	1279+60	6335	3	0	0	84	0	0	0	0	0	158	712	0	0	0	0	0	2.49%	12.61%	0.00%	0.20	0.20	0.12	84.3	8.7	94.9	8.5
357 Total	wb	2640	3168	1279+60	1274+32	6335	32	0	0	161	0	0	0	0	0	317	699	0	0	0	0	0	5.00%	14.08%	0.00%	0.21	0.18	0.15	106.5	8.3	95.8	8.5
358 Total	wb	3168	3696	1274+32	1269+04	6335	0	0	0	410	0	0	0	0	0	582	866	40	0	0	0	0	9.19%	20.14%	0.63%	0.21	0.17	0.16	98.8	8.4	120.2	8.1
359 Total	wb	3696	4224	1269+04	1263+76	6335	16	0	0	290	0	0	0	0	0	470	779	0	0	0	0	0	7.42%	17.13%	0.00%	0.17	0.13	0.15	82.4	8.7	94.4	8.5
360 Total	wb	4224	4752	1263+76	1258+48	6335	0	0	0	305	0	0	0	0	0	654	865	0	0	0	0	0	10.32%	18.47%	0.00%	0.19	0.15	0.14	78.6	8.7	99.5	8.4
361 Total	wb	4752	5280	1258+48	1253+20	6335	0	0	0	1135	0	0	0	0	0	779	717	16	0	0	0	0	12.30%	29.23%	0.25%	0.17	0.13	0.14	74.6	8.8	95.8	8.5
362 Total	wb	5280	5808	1253+20	1247+92	6335	0	0	0	685	0	0	0	0	0	921	880	0	0	0	0	0	14.54%	24.70%	0.00%	0.25	0.24	0.12	79.4	8.7	103.7	8.3
363 Total	wb	5808	6336	1247+92	1242+64	6335	55	0	0	1136	0	0	0	0	0	1048	808	0	0	0	0	0	16.54%	31.55%	0.00%	0.20	0.18	0.14	76.8	8.8	88.3	8.6
364 Total	wb	6336	6864	1242+64	1237+36	6335	191	0	0	1216	0	0	0	0	0	950	765	0	0	0	0	0	15.00%	34.29%	0.00%	0.19	0.17	0.12	64.9	9.0	87.6	8.6
365 Total	wb	6864	7392	1237+36	1232+08	6335	227	0	0	566	0	0	0	0	0	1057	1402	0	0	0	0	0	16.69%	34.65%	0.00%	0.23	0.23	0.08	77.4	8.8	100.7	8.4
366 Total	wb	7392	7920	1232+08	1226+80	6335	0	0	0	430	0	0	0	0	0	710	918	0	0	0	0	0	11.21%	21.28%	0.00%	0.22	0.21	0.12	70.2	8.9	103.5	8.4
367 Total	wb	7920	8448	1226+80	1221+52	6335	16	0	0	32	0	0	0	0	0	330	1112	0	0	0	0	0	5.21%	18.31%	0.00%	0.26	0.26	0.13	90.1	8.6	109.5	8.3
368 Total	wb	8448	8976	1221+52	1216+24	6335	27	0	0	174	0	0	0	0	0	603	993	0	0	0	0	0	9.52%	18.85%	0.00%	0.24	0.23	0.13	89.6	8.6	103.3	8.4
369 Total	wb	8976	9504	1216+24	1210+96	6335	242	0	0	944	0	0	0	0	0	1021	1442	0	0	0	0	0	16.12%	41.48%	0.00%	0.26	0.25	0.12	66.9	8.9	103.5	8.4
370 Total	wb	9504	10032	1210+96	1205+68	6335	55	0	0	555	0	0	0	0	0	700	1092	0	0	0	0	0	11.05%	26.87%	0.00%	0.23	0.23	0.11	64.4	9.0	96.8	8.5
371 Total	wb	10032	10560	1205+68	1200+40	6335	260	0	0	1409	0	0	0	0	0	525	1229	0	0	0	0	0	8.29%	45.75%	0.00%	0.27	0.26	0.11	82.5	8.7	103.1	8.4
372 Total	wb	10560	11088	1200+40	1195+12	6335	75	0	0	360	0	0	0	0	0	536	1199	0	0	0	0	0	8.46%	25.79%	0.00%	0.29	0.29	0.11	71.7	8.9	95.1	8.5
373 Total	wb	11088	11616	1195+12	1189+84	6335	183	0	0	350	0	0	0	0	0	544	1062	0	0	0	0	0	8.59%	25.18%	0.00%	0.36	0.36	0.23	69.2	8.9	104.7	8.3
374 Total	wb	11616	12144	1189+84	1184+56	6335	24	0	0	0	0	0	0	0	0	634	902	0	0	0	0	0	10.01%	14.62%	0.00%	0.25	0.24	0.11	69.3	8.9	80.9	8.7
375 Total	wb	12144	12672	1184+56	1179+28	6335	0	0	0	0	0	0	0	0	0	323	931	0	0	0	0	0	5.10%	14.70%	0.00%	0.31	0.31	0.17	93.0	8.5	88.6	8.6
376 Total	wb	12672	13200	1179+28	1174+00	6335	109	0	0	39	0	0	0	0	0	0	980	0	0	0	0	0	0.00%	17.81%	0.00%	0.27	0.26	0.16	83.4	8.7	89.3	8.6
377 Total	wb	13200	13728	1174+00	1168+72	6335	302	0	0	0	0	0	0	0	0	8	1194	0	0	0	0	0	0.13%	23.61%	0.00%	0.27	0.27	0.12	91.4	8.5	85.4	8.6
378 Total	wb	13728	14256	1168+72	1163+44	6335	159	0	0	1359	0	0	0	0	0	0	916	80	0	0	0	0	0.00%	38.42%	1.26%	0.25	0.24	0.10	85.8	8.6	72.0	8.8
379 Total	wb	14256	14784	1163+44	1158+16	6335	116	0	0	435	0	0	0	0	0	265	1334	0	0	0	0	0	4.18%	29.76%	0.00%	0.21	0.20	0.12	82.5	8.7	104.0	8.3
380 Total	wb	14784	15312	1158+16	1152+88	6335	91	0	0	16	0	0	0	0	0	0	1038	0	0	0	0	0	0.00%	18.07%	0.00%	0.24	0.23	0.14	90.8	8.6	82.5	8.7
381 Total	wb	15312	15840	1152+88	1147+60	6335	50	0	0	111	0	0	0	0	0	0	929	0	0	0	0	0	0.00%	17.63%	0.00%	0.24	0.23	0.11	65.5	8.9	76.3	8.8
382 Total	wb	15840	16368	1147+60	1142+32	6335	216	0	0	167	0	0	0	0	0	415	955	0	0	0	0	0	6.55%	21.12%	0.00%	0.23	0.23	0.11	88.4	8.6	106.9	8.3
383 Total	wb	16368	16896	1142+32	1137+04	6335	183	0	0	0	0	0	0	0	0	467	982	0	0	0	0	0	7.37%	18.39%	0.00%	0.20	0.19	0.11	70.3	8.9	73.9	8.8
384 Total	wb	16896	17424	1137+04	1131+76	6335	59	0	0	315	0	0	0	0	0	525	812	11	0	0	0	0	8.29%	18.72%	0.17%	0.22	0.22	0.13	81.7	8.7	71.5	8.9
385 Total	wb	17424	17952	1131+76	1126+48	6335	103	0	0	462	0	0	0	0	0	525	955	0	0	0	0	0	8.29%	23.99%	0.00%	0.28	0.27	0.13	69.2	8.9	69.9	8.9
386 Total	wb	17952	18480	1126+48	1121+20	6335	0	0	0	959	0	0	0	0	0	360	582	0	0	0	0	0	5.68%	24.33%	0.00%	0.27	0.27	0.13	69.1	8.9	64.0	9.0
387 Total	wb	18480	19008	1121+20	1115+92	6335	156	0	0	373	0	0	0	0	0	142	681	0	0	0	0	0	2.24%	19.10%	0.00%	0.21	0.21	0.11	65.3	9.0	80.5	8.7
388 Total	wb	19008	19536	1115+92	1110+64	6335	19	0	0	0	0	0	0	0	0	142	663	0	0	0	0	0	2.24%	10.77%	0.00%	0.26	0.21	0.22	58.7	8.9	58.2	8.8
389 Total	wb	19536	20064	1110+64	1105+36	6335	24	0	0	0	0	0	0	0	0	119	716	83	0	0	0	0	1.88%	11.66%	1.31%	0.24	0.24	0.17	61.0	9.0	76.8	8.8
390 Total	wb	20064	20592	1105+36	1100+08	6335	70	0	0	67	0	0	0	0	0	409	733	0	0	0	0	0	6.46%	13.58%	0.00%	0.21	0.21	0.09	79.0	8.7	92.0	8.5
391 Total	wb	20592	21120	1100+08	1094+80	6335	202	0	0	0	0	0	0	0	0	574	1004	0	0	0	0	0	9.06%	19.04%	0.00%	0.21	0.19	0.15	96.5	8.5	103.7	8.3
392 Total	wb	21120	21648	1094+80	1089+52	6335	151	0	0	597	0	0	0	0	0	216	787	0	0	0	0	0	3.41%	24.73%	0.00%	0.13	0.10	0.11	85.2	8.6	100.4	8.4
393 Total	wb	21648	22176	1089+52	1084+24	6335	78	0	0	14	0	0	0	0	0	161	995	35	0	0	0	0	2.54%	17.16%	0.55%	0.14	0.12	0.09	84.1	8.7	107.6	8.3
394 Total	wb	22176	22704	1084+24	1078+96	6335	48	0	0	0	0	0	0	0	0	510	765	0	0	0	0	0	8.05%	12.83%	0.00%	0.23	0.22	0.14	67.7	8.9	68.7	8.9
395 Total	wb	22704	23232	1078+96	1073+68	6335	16	0	0	217	0	0	0	0	0	182	790	0	0	0	0	0	2.87%	16.15%	0.00%	0.24	0.22	0.17	85.4	8.6	87.3	8.6
396 Total	wb	23232	23760	1073+68	1068+40	6335	0	0	0	166	0	0	0	0	0	479	604	0	0	0	0	0	7.56%	12.15%	0.00%	0.26	0.26	0.13	81.0	8.7	69.3	8.9
397 Total	wb	23760	24288	1068+40	1063+12	6335	384	0	0	564	0	0	0	0	0	127	779	0	0	0	0	0	2.00%	27.28%	0.00%	0.26	0.26	0.14	85.0	8.6	73.8	8.8
398 Total	wb	24288	24816	1063+12	1057+84	6335	22	0	0	201	0	0	0	0	0	0	865	0	0	0	0	0	0.00%	17.17%	0.00%	0.26	0.24	0.20	84.8	8.6	78.6	8.7
399 Total	wb	24816	25344	1057+84	1052+56	6335	46	0	0	197	0	0	0	0	0	348	1004	0	0	0	0	0	5.49%	19.68%	0.00%	0.25	0.25	0.11	77.4	8.8	106.6	8.3
400 Total	wb	25344	25872	1052+56	1047+28	6335	0	0	0	209	0	0	0	0	0	37	869	52	0	0	0	0	0.58%	17.02%	0.82%	0.17	0.15	0.10	78.2	8.8	111.7	8.2
401 Total	wb	25872	26400	1047+28	1042+00	6335	183	0	0	48	0	0	0	0	0	152	836	0	0	0	0	0	2.40%	18.84%	0.00%	0.19	0.17	0.10	69.9	8.9	77.1	8.8
402 Total	wb	26400	26928	1042+00	1036+72	6335	0	0	0	0	0	0	0	0	0	267	610	0	0	0	0	0	4.21%	9.63%	0.00%	0.22	0.22	0.12	56.9	8.9	87.5	8.6
403 Total	wb	26928	27456	1036+72	1031+44	6335	11	0	0	252	0	0	0	0	0	522	629	0	0	0	0	0	8.24%	14.08%	0.00%	0.25	0.24	0.16	64.6	9.0	91.0	8.5
404 Total	wb	27456	27984	1031+44	1026+16	6335	31	0	0	148	0	0	0	0	0	775	973	8	0	0	0	0	12.23%	18.18%	0.13%	0.27	0.27	0.15	67.6	8.9	84.6	8.6
405 Total	wb	27984	28512	1026+16	1020+88	6335	0	0	0	16	0	0	0	0	0	659	1025	0	0	0	0	0	10.40%	16.43%	0.00%	0.19	0.18	0.10	65.4	9.0	77.6	8.8
406 Total	wb	28512	29040	1020+88	1015+60	6335	11	0	0	38	0	0	0	0	0	580	755	0	0	0	0	0	9.16%	12.69%	0.00%	0.17	0.16	0.08	68.7	8.9	86.8	8.6
407 Total	wb	29040	29568	1015+60	1010+32	6335	0	0	0	240	0	0	0	0	0	938	982	0	0	0	0	0	14.81%	19.29%	0.00%	0.20	0.20	0.11	70.2	8.9	125.4	8.0
408 Total	wb	29568	30096	1010+32	1005+04	6335	43	0	0	604	0	0	0	0	0	843	945	0	0	0	0	0	13.31%	25.13%	0.00%	0.28	0.28	0.14	72.2	8.8	113.2	8.2
409 Total	wb	30096	30624	1005+04	999+76	6335	147	0	0	626	0	0	0	0	0	550	1188	10	0	0	0	0	8.68%	30.94%	0.16%	0.31	0.31	0.17	90.8	8.6	112.1	8.2
410 Total	wb	30624	31152	999+76	994+48	6335	0	0	0	211	0	0	0	0	0	173	790	13	0	0	0	0	2.73%	15.80%	0.21%	0.16	0.16	0.12	51.6	9.0	98.6	8.4
411 Total	wb	31152	31680	994+48	989+20	6335	0	0	0	0	0	0	0	0	0	301	884	0	0	0	0	0	4.75%	13.96%	0.00%	0.23	0.23	0.11	63.8	9.0	106.9	8.3
412 Total	wb	31680	32208	989+20	983+92	6335	0	0	0	0	0	0	0	0	0	706	766	0	0	0	0	0	11.14%	12.09%	0.00%	0.23	0.23	0.11	58.0	9.1	102.2	8.4
413 Total	wb	32208	32736	983+92	978+64	6335	0	0	0	748	0	0	0	0	0	331	765	0	0	0	0	0	5.22%	23.88%	0.00%	0.22	0.22	0.12	65.3	9.0	103.1	8.4
414 Total	wb	32736	33264	978+64	973+36	6335	35	0	0	375	0	0	0	0	0	422	820	0	0	0	0	0	6.66%	18.46%	0.00%	0.25	0.25	0.17	84.7	8.6	78.2	8.7
415 Total	wb	33264	33792	973+36	968+08	6335	0	0	0	0	0	0	0	0	0	915	999	0	0	0	0	0	14.44%	15.77%	0.00%	0.30	0.29	0.21	64.7	9.0	79.3	8.7
416 Total	wb	33792	34320	968+08	962+80	6335	207	0	0	0	0	0	0	0	0	1057	1031	0	0	0	0	0	16.69%	19.54%	0.00%	0.35	0.34	0.25	83.1	8.7	103.8	8.3
417 Total	wb	34320	34848	962+80	957+52	6335	0	0	0	0	0	0	0	0	0	1057	841	29	0	0	0	0	16.69%	13.28%	0.46%	0.31	0.31	0.20	56.3	9.1	73.0	8.8
418 Total	wb	34848	35376	957+52	952+24	6335	0	0	0	0	0	0	0	0	0	900	804	8	0	0	0	0	14.21%	12.69%	0.13%	0.31	0.30	0.17	92.1	8.5	88.1	8.6
419 Total	wb	35376	35904	952+24	946+96	6335	214	0	0	660	0	0	0	0	0	662	884	0	0	0	0	0	10.45%	27.76%	0.00%	0.33	0.33	0.17	71.6	8.9	96.9	8.5
420 Total	wb	35904	36432	946+96	941+68	6335	0	0	0	482	0	0	0	0	0	438	718	0	0	0	0	0	6.88%	16.94%	0.00%	0.28	0.26	0.19	62.1	9.0	69.3	8.9

Tamiami Trail Surface Distress Data - 1/10 Mile Summary
From Infrastructure Management Systems

Object	Direction	Beg Sta	End Sta	Begin Station T	End Station	AREA(ft2)	All-NWP-II	All-NWP-III	All-NWP-S	All-WP-II	All-WP-III	All-WP-S	BLK-IB	BLK-II	BLK-III	LONG-IB	LONG-II	LONG-III	LONG-S	RAVEL-L	RAVEL-M	RAVEL-H	%CL-IB	%CL-II	%CL-III	rut_tot_le	rut_rght	rut_left	Iri_r	Mdotride_r	Iri_l	MdotRide_l
421 Total	wb	36432	36960	941+68	936+40	6335	0	0	0	405	0	0	0	0	0	322	987	0	0	0	0	0	5.08%	21.97%	0.00%	0.29	0.27	0.20	85.9	8.6	112.5	8.2
422 Total	wb	36960	37488	936+40	931+12	6335	0	0	0	46	0	0	0	0	0	261	868	0	0	0	0	0	4.12%	14.43%	0.00%	0.24	0.22	0.20	75.2	8.8	118.4	8.1
423 Total	wb	37488	38016	931+12	925+84	6335	0	0	0	296	0	0	0	0	0	92	889	19	0	0	0	0	1.45%	18.71%	0.30%	0.27	0.27	0.17	53.2	9.1	81.3	8.7
424 Total	wb	38016	38544	925+84	920+56	6335	0	0	0	1339	0	0	0	0	0	525	806	16	0	0	0	0	8.29%	33.88%	0.25%	0.30	0.30	0.17	72.5	8.8	103.0	8.4
425 Total	wb	38544	39072	920+56	915+28	6335	0	0	0	920	0	0	0	0	0	377	918	0	0	0	0	0	5.95%	29.01%	0.00%	0.22	0.22	0.12	95.3	9.0	161.5	7.4
426 Total	wb	39072	39600	915+28	910+00	6335	0	0	0	456	16	0	0	0	0	301	859	8	0	0	0	0	4.75%	20.92%	0.38%	0.30	0.29	0.21	56.1	8.9	87.4	8.5
427 Total	wb	39600	40128	910+00	904+72	6335	0	0	0	692	23	0	0	0	0	433	1003	0	0	0	0	0	6.84%	28.76%	0.36%	0.30	0.29	0.21	90.3	8.6	136.9	7.8
428 Total	wb	40128	40656	904+72	899+44	6335	0	0	0	1582	0	0	0	0	0	501	972	8	0	0	0	0	7.91%	40.32%	0.13%	0.22	0.20	0.15	52.5	9.2	116.3	8.2
429 Total	wb	40656	41184	899+44	894+16	6335	0	0	0	1371	0	0	0	0	0	525	887	0	0	0	0	0	8.29%	35.80%	0.00%	0.28	0.27	0.18	56.4	9.1	78.7	8.7
430 Total	wb	41184	41712	894+16	888+88	6335	0	0	0	525	0	0	0	0	0	525	783	0	0	0	0	0	8.29%	30.65%	0.00%	0.26	0.26	0.18	53.1	9.1	70.4	8.9
431 Total	wb	41712	42240	888+88	883+60	6335	0	0	0	423	0	0	0	0	0	138	700	0	0	0	0	0	2.18%	17.73%	0.00%	0.22	0.21	0.14	68.4	8.9	99.3	8.4
432 Total	wb	42240	42768	883+60	878+32	6335	0	0	0	229	0	0	0	0	0	388	1032	0	0	0	0	0	6.12%	19.91%	0.00%	0.18	0.16	0.13	75.9	8.8	124.0	8.0
433 Total	wb	42768	43296	878+32	873+04	6335	0	0	0	56	0	0	0	0	0	185	1092	0	0	0	0	0	2.92%	18.60%	0.00%	0.19	0.18	0.08	73.8	8.8	124.5	8.0
434 Total	wb	43296	43824	873+04	867+76	6335	245	0	0	113	0	0	0	0	0	660	833	5	0	0	0	0	10.42%	18.80%	0.08%	0.21	0.20	0.14	67.7	8.9	107.6	8.3
435 Total	wb	43824	44352	867+76	862+48	6335	82	0	0	0	0	0	0	0	0	818	780	0	0	0	0	0	12.91%	13.61%	0.00%	0.23	0.22	0.13	72.3	8.8	94.9	8.5
436 Total	wb	44352	44880	862+48	857+20	6335	0	0	0	54	0	0	0	0	0	598	726	0	0	0	0	0	9.44%	12.31%	0.00%	0.28	0.25	0.25	74.0	8.8	82.6	8.7
437 Total	wb	44880	45408	857+20	851+92	6335	15	0	0	90	0	0	0	0	0	791	808	0	0	0	0	0	12.49%	14.41%	0.00%	0.26	0.24	0.20	69.8	8.9	108.3	8.3
438 Total	wb	45408	45936	851+92	846+64	6335	0	0	0	723	0	0	0	0	0	643	906	0	0	0	0	0	10.15%	25.71%	0.00%	0.23	0.23	0.07	61.7	9.0	80.2	8.7
439 Total	wb	45936	46464	846+64	841+36	6335	0	0	0	270	0	0	0	0	0	455	825	0	0	0	0	0	7.18%	17.28%	0.00%	0.22	0.22	0.10	57.7	9.1	88.7	8.6
440 Total	wb	46464	46992	841+36	836+08	6335	0	0	0	476	0	0	0	0	0	587	930	0	0	0	0	0	9.27%	22.18%	0.00%	0.26	0.25	0.16	52.9	9.1	66.7	8.9
441 Total	wb	46992	47520	836+08	830+80	6335	0	0	0	115	0	0	0	0	0	140	702	0	0	0	0	0	2.21%	12.90%	0.00%	0.22	0.21	0.11	52.0	9.2	74.9	8.8
442 Total	wb	47520	48048	830+80	825+52	6335	0	0	0	432	0	0	0	0	0	279	733	0	0	0	0	0	4.40%	18.39%	0.00%	0.28	0.28	0.16	55.1	9.1	77.2	8.8
443 Total	wb	48048	48576	825+52	820+24	6335	0	0	0	0	0	0	0	0	0	673	909	0	0	0	0	0	10.62%	14.35%	0.00%	0.25	0.24	0.17	58.2	9.1	92.9	8.5
444 Total	wb	48576	49104	820+24	814+96	6335	0	0	0	61	0	0	0	0	0	520	879	0	0	0	0	0	8.21%	14.54%	0.00%	0.20	0.20	0.11	51.1	9.2	95.2	8.5
445 Total	wb	49104	49632	814+96	809+68	6335	18	0	0	23	0	0	0	0	0	161	900	0	0	0	0	0	2.54%	14.85%	0.00%	0.18	0.17	0.11	61.8	9.0	94.8	8.5
446 Total	wb	49632	50160	809+68	804+40	6335	0	0	0	0	0	0	0	0	0	440	636	0	0	0	0	0	6.95%	10.04%	0.00%	0.17	0.15	0.11	67.3	8.9	77.1	8.5
447 Total	wb	50160	50688	804+40	799+12	6335	39	0	0	52	0	0	0	0	0	525	748	0	0	0	0	0	8.29%	13.24%	0.00%	0.15	0.14	0.07	69.2	8.9	92.6	8.5
448 Total	wb	50688	51216	799+12	793+84	6335	0	0	0	385	0	0	0	0	0	511	711	0	0	0	0	0	8.07%	17.30%	0.00%	0.24	0.23	0.14	70.5	8.9	88.3	8.6
449 Total	wb	51216	51744	793+84	788+56	6335	0	0	0	0	0	0	0	0	0	228	709	0	0	0	0	0	3.60%	11.19%	0.00%	0.23	0.22	0.14	78.5	8.7	103.1	8.4
450 Total	wb	51744	52272	788+56	783+28	6335	0	0	0	0	0	0	0	0	0	498	872	0	0	0	0	0	7.86%	13.76%	0.00%	0.16	0.16	0.06	63.7	9.0	99.5	8.4
451 Total	wb	52272	52800	783+28	778+00	6335	0	0	0	0	0	0	0	0	0	599	878	0	0	0	0	0	9.46%	13.86%	0.00%	0.23	0.22	0.15	78.2	8.7	111.6	8.2
452 Total	wb	52800	53328	778+00	772+72	6335	0	0	0	0	0	0	0	0	0	420	397	0	0	0	0	0	6.63%	6.27%	0.00%	0.17	0.15	0.11	49.4	9.2	74.0	8.8
453 Total	wb	53328	53856	772+72	767+44	6335	0	0	0	0	0	0	0	0	0	828	754	0	0	0	0	0	13.07%	11.90%	0.00%	0.23	0.21	0.16	65.0	9.0	83.0	8.7
454 Total	wb	53856	54384	767+44	762+16	6335	0	0	0	0	0	0	0	0	0	805	635	0	0	0	0	0	12.71%	10.02%	0.00%	0.16	0.15	0.08	52.4	9.2	87.2	8.6
455 Total	wb	54384	54912	762+16	756+88	6335	0	0	0	0	0	0	0	0	0	373	811	0	0	0	0	0	5.89%	12.80%	0.00%	0.23	0.20	0.20	64.2	9.0	83.7	8.7
456 Total	wb	54912	55440	756+88	751+60	6335	0	0	0	57	0	0	0	0	0	486	813	0	0	0	0	0	7.67%	13.73%	0.00%	0.23	0.19	0.20	68.7	8.9	102.7	8.4
457 Total	wb	55440	55968	751+60	746+32	6335	0	0	0	0	0	0	0	0	0	579	1023	0	0	0	0	0	9.14%	16.15%	0.00%	0.24	0.21	0.22	61.6	9.0	92.2	8.5
458 Total	wb	55968	56496	745+05	739+77	6335	0	0	0	0	0	0	0	0	0		717	0	0	0	0	0	4.14%	11.32%	0.00%	0.27	0.25	0.20	66.4	8.9	87.5	8.6
459 Total	wb	56496	57024	739+77	734+49	6335	0	0	0	0	0	0	0	0	0	49	220	0	0	0	0	0	0.77%	3.47%	0.00%	0.23	0.14	0.22	75.6	8.8	90.1	8.6
460 Total	wb	57024	57368	734+49	731+15	4004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.27	0.07	0.27	79.3	8.7	62.2	9.0
Average							50.7	0.0	0.0	303.7	0.4	0.0	0.0	0.0	0.0	451.5	839.2	4.0	0.0	0.0	0.0	0.0	7.1%	18.8%	0.1%	0.23	0.22	0.14	72.45	8.8	92.83	8.5
Max							384.0	0.0	0.0	1582.0	23.0	0.0	0.0	0.0	0.0	1057.0	1442.0	63.0	0.0	0.0	0.0	0.0	16.7%	45.7%	1.3%	0.36	0.36	0.27	108.54	9.2	161.48	9.0
Min							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	0.0%	0.0%	0.13	0.07	0.06	49.42	8.3	62.22	7.4
Median							0.0	0.0	0.0	167.0	0.0	0.0	0.0	0.0	0.0	468.5	859.0	0.0	0.0	0.0	0.0	0.0	7.4%	17.8%	0.0%	0.23	0.22	0.14	70.24	8.9	92.23	8.5
Mode							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	525.0	785.0	0.0	0.0	0.0	0.0	0.0	8.3%	0.0%	0.0%	0.23	0.10	0.15	66.89	8.9	94.86	8.5
Standard Deviation							62.4	0.0	0.0	378.3	2.7	0.0	0.0	0.0	0.0	281.6	227.4	13.4	0.0	0.0	0.0	0.0	4.4%	8.1%	0.2%	0.05	0.05	0.04	11.94	0.2	18.76	0.3

Object	Direction	Beg Sta	End Sta	Begin Station	End Station	AREA(ft2)	All-NWP-II	All-NWP-III	All-NWP-S	All-WP-II	All-WP-III	All-WP-S	BLK-IB	BLK-II	BLK-III	LONG-IB	LONG-II	LONG-III	LONG-S	RAVEL-L	RAVEL-M	RAVEL-H	%CL-IB	%CL-II	%CL-III	rut_hd_le	rut_right	rut_left	IRI_r	HotRide_r	IRI_l	HotRide_l
463 Total	eb	0	528	729+56	734+84	6335	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%	0.00%	0.00%	0.16	0.10	0.14	125.8	8.0	130.5	7.9
464 Total	eb	528	1056	734+84	740+12	6335	0	0	0	0	0	0	0	0	0	307	615	0	0	0	0	0	4.86%	8.13%	0.00%	0.24	0.19	0.19	84.4	8.7	107.8	8.3
465 Total	eb	1056	1584	740+12	746+67	6335	127	0	0	79	0	0	0	0	0	576	1027	0	0	0	0	0	9.09%	18.46%	0.00%	0.26	0.23	0.19	98.9	8.4	111.6	8.2
466 Total	eb	1584	2112	746+67	751+95	6335	320	0	0	774	0	0	0	0	0	146	752	17	0	0	0	0	2.30%	29.14%	0.27%	0.31	0.31	0.15	71.0	8.9	94.7	8.5
467 Total	eb	2112	2640	751+95	757+23	6335	129	0	0	954	0	0	0	0	0	423	957	51	0	0	0	0	6.68%	32.30%	0.81%	0.32	0.31	0.15	63.7	9.0	114.0	8.2
468 Total	eb	2640	3168	757+23	762+51	6335	613	0	0	1683	0	0	0	0	0	512	982	55	0	0	0	0	8.08%	51.74%	0.87%	0.26	0.22	0.21	89.6	8.8	82.4	8.7
469 Total	eb	3168	3696	762+51	767+79	6335	176	0	0	891	45	0	0	0	0	497	938	16	0	0	0	0	7.85%	31.49%	0.96%	0.25	0.17	0.22	92.2	8.5	119.1	8.1
470 Total	eb	3696	4224	767+79	773+07	6335	182	0	0	1393	222	0	0	0	0	501	1046	0	0	0	0	0	7.91%	41.37%	3.50%	0.21	0.15	0.19	101.0	8.4	110.2	8.2
471 Total	eb	4224	4752	773+07	778+35	6335	455	0	0	814	0	0	0	0	0	380	985	8	0	0	0	0	6.00%	35.58%	0.13%	0.20	0.18	0.13	94.8	8.5	112.6	8.2
472 Total	eb	4752	5280	778+35	783+63	6335	199	0	0	154	0	0	0	0	0	389	865	31	0	0	0	0	6.14%	19.23%	0.49%	0.19	0.14	0.15	99.7	8.4	92.3	8.5
473 Total	eb	5280	5808	783+63	788+91	6335	132	0	0	387	0	0	0	0	0	446	911	0	0	0	0	0	7.04%	22.57%	0.00%	0.22	0.16	0.19	93.1	8.5	123.4	8.0
474 Total	eb	5808	6336	788+91	794+19	6335	211	0	0	788	0	0	0	0	0	888	1075	0	0	0	0	0	14.02%	32.42%	0.00%	0.21	0.19	0.12	86.6	8.6	112.3	8.2
475 Total	eb	6336	6864	794+19	799+47	6335	59	0	0	889	0	0	0	0	0	782	937	0	0	0	0	0	12.34%	29.76%	0.00%	0.25	0.21	0.19	93.7	8.5	107.2	8.3
476 Total	eb	6864	7392	799+47	804+75	6335	14	0	0	50	0	0	0	0	0	472	983	0	0	0	0	0	7.45%	16.53%	0.00%	0.29	0.19	0.28	77.6	8.8	88.9	8.5
477 Total	eb	7392	7920	804+75	810+03	6335	117	0	0	48	0	0	0	0	0	763	835	0	0	0	0	0	12.04%	15.75%	0.00%	0.26	0.25	0.18	68.7	8.9	97.9	8.4
478 Total	eb	7920	8448	810+03	815+31	6335	9	0	0	66	0	0	0	0	0	828	975	0	0	0	0	0	13.07%	15.90%	0.00%	0.24	0.23	0.11	68.3	8.9	106.4	8.3
479 Total	eb	8448	8976	815+31	820+59	6335	10	0	0	7	0	0	0	0	0	778	866	0	0	0	0	0	12.28%	13.78%	0.00%	0.23	0.22	0.15	67.6	8.9	92.6	8.5
480 Total	eb	8976	9504	820+59	825+87	6335	233	0	0	64	0	0	0	0	0	654	741	48	0	0	0	0	10.32%	16.39%	0.76%	0.28	0.23	0.24	77.1	8.8	107.1	8.3
481 Total	eb	9504	10032	825+87	831+15	6335	28	0	0	238	0	0	0	0	0	456	739	0	0	0	0	0	7.96%	15.86%	0.00%	0.25	0.22	0.22	59.4	9.0	88.8	8.6
482 Total	eb	10032	10560	831+15	836+43	6335	173	0	0	551	0	0	0	0	0	667	839	0	0	0	0	0	10.84%	24.67%	0.00%	0.21	0.20	0.14	79.0	8.7	136.8	7.8
483 Total	eb	10560	11088	836+43	841+71	6335	239	0	0	233	0	0	0	0	0	657	916	0	0	0	0	0	10.37%	21.89%	0.00%	0.21	0.20	0.17	72.3	8.8	123.7	8.0
484 Total	eb	11088	11616	841+71	846+99	6335	960	24	0	1124	48	0	0	0	0	1003	1053	61	0	0	0	0	15.83%	49.52%	2.10%	0.30	0.22	0.27	86.5	8.6	160.9	7.5
485 Total	eb	11616	12144	846+99	852+27	6335	96	0	0	731	0	0	0	0	0	751	935	0	0	0	0	0	11.85%	27.81%	0.00%	0.24	0.19	0.21	63.5	9.0	107.9	8.3
486 Total	eb	12144	12672	852+27	857+55	6335	341	0	0	438	0	0	0	0	0	994	857	0	0	0	0	0	15.69%	25.82%	0.00%	0.29	0.17	0.28	59.8	8.9	119.8	8.1
487 Total	eb	12672	13200	857+55	862+83	6335	382	0	0	293	0	0	0	0	0	771	828	64	0	0	0	0	12.17%	23.41%	1.01%	0.30	0.19	0.30	79.2	8.9	117.0	8.1
488 Total	eb	13200	13728	862+83	868+11	6335	353	0	0	348	23	0	0	0	0	854	971	11	0	0	0	0	13.48%	26.36%	0.54%	0.24	0.18	0.22	80.9	8.7	116.7	8.1
489 Total	eb	13728	14256	868+11	873+39	6335	910	0	0	984	0	0	0	0	0	1036	1007	0	0	0	0	0	16.35%	45.79%	0.00%	0.24	0.14	0.24	51.3	9.2	103.0	8.4
490 Total	eb	14256	14784	873+39	878+67	6335	1038	0	0	1043	0	0	0	0	0	1057	1021	0	0	0	0	0	16.69%	48.87%	0.00%	0.24	0.14	0.23	80.4	8.7	109.3	8.3
491 Total	eb	14784	15312	878+67	883+95	6335	409	0	0	575	0	0	0	0	0	889	853	16	0	0	0	0	14.00%	29.06%	0.25%	0.21	0.18	0.16	65.4	8.9	96.1	8.5
492 Total	eb	15312	15840	883+95	889+23	6335	55	0	0	140	0	0	0	0	0	645	467	5	0	0	0	0	10.18%	10.45%	0.08%	0.27	0.26	0.20	69.9	8.9	85.6	8.6
493 Total	eb	15840	16368	889+23	894+51	6335	3	0	0	412	0	0	0	0	0	201	731	0	0	0	0	0	3.17%	18.09%	0.00%	0.26	0.24	0.21	67.1	8.9	98.1	8.4
494 Total	eb	16368	16896	894+51	899+79	6335	270	0	0	631	0	0	0	0	0	363	1034	0	0	0	0	0	5.73%	30.54%	0.00%	0.24	0.18	0.23	61.4	9.0	89.1	8.6
495 Total	eb	16896	17424	899+79	905+07	6335	747	0	0	448	0	0	0	0	0	304	561	0	0	0	0	0	4.80%	27.72%	0.00%	0.24	0.20	0.29	56.8	9.1	89.2	8.6
496 Total	eb	17424	17952	905+07	910+35	6335	26	0	0	629	0	0	0	0	0	80	977	13	0	0	0	0	1.26%	25.76%	0.21%	0.26	0.21	0.22	68.0	8.9	98.2	8.6
497 Total	eb	17952	18480	910+35	915+63	6335	30	0	0	46	0	0	0	0	0	243	847	5	0	0	0	0	3.84%	14.57%	0.08%	0.29	0.21	0.28	62.4	9.0	81.3	8.7
498 Total	eb	18480	19008	915+63	920+91	6335	72	0	0	1345	0	0	0	0	0	661	1036	0	0	0	0	0	10.43%	37.92%	0.00%	0.26	0.24	0.22	69.6	9.0	69.4	8.8
499 Total	eb	19008	19536	920+91	926+19	6335	0	0	0	0	0	0	0	0	0	552	851	0	0	0	0	0	8.71%	13.43%	0.00%	0.25	0.22	0.22	54.1	9.1	83.9	8.7
500 Total	eb	19536	20064	926+19	931+47	6335	47	0	0	0	0	0	0	0	0	274	936	2	0	0	0	0	4.33%	15.52%	0.03%	0.26	0.21	0.23	47.0	9.2	65.9	8.9
501 Total	eb	20064	20592	931+47	936+75	6335	0	0	0	0	0	0	0	0	0	90	754	0	0	0	0	0	1.42%	12.06%	0.00%	0.24	0.23	0.17	74.5	8.8	96.2	8.5
502 Total	eb	20592	21120	936+75	942+03	6335	93	0	0	0	0	0	0	0	0	69	612	0	0	0	0	0	1.09%	11.13%	0.00%	0.30	0.23	0.19	49.2	9.2	64.6	9.0
503 Total	eb	21120	21648	942+03	947+31	6335	294	0	0	38	0	0	0	0	0	0	872	0	0	0	0	0	0.00%	19.01%	0.00%	0.33	0.28	0.31	56.4	9.1	71.8	8.8
504 Total	eb	21648	22176	947+31	952+59	6335	125	0	0	864	0	0	0	0	0	45	722	0	0	0	0	0	0.71%	27.01%	0.00%	0.30	0.25	0.26	53.8	9.1	59.1	9.0
505 Total	eb	22176	22704	952+59	957+87	6335	185	0	0	1113	0	0	0	0	0	31	919	12	0	0	0	0	0.49%	35.00%	0.19%	0.30	0.29	0.19	83.7	9.0	71.1	8.8
506 Total	eb	22704	23232	957+87	963+15	6335	51	0	0	1517	0	0	0	0	0	372	901	0	0	0	0	0	5.08%	38.97%	0.00%	0.23	0.23	0.11	58.0	9.1	102.0	8.4
507 Total	eb	23232	23760	963+15	968+43	6335	191	0	0	941	0	0	0	0	0	416	814	0	0	0	0	0	6.57%	27.56%	0.00%	0.21	0.19	0.16	58.2	9.1	113.8	8.2
508 Total	eb	23760	24288	968+43	973+71	6335	142	0	0	907	0	0	0	0	0	99	948	0	0	0	0	0	1.56%	31.52%	0.00%	0.24	0.22	0.17	56.7	9.1	91.0	8.5
509 Total	eb	24288	24816	973+71	978+99	6335	182	0	0	845	0	0	0	0	0	349	851	0	0	0	0	0	5.51%	29.84%	0.00%	0.15	0.14	0.09	67.3	8.9	116.9	8.2
510 Total	eb	24816	25344	978+99	984+27	6335	443	0	0	71	0	0	0	0	0	315	983	0	0	0	0	0	4.97%	23.63%	0.00%	0.14	0.13	0.09	55.1	9.0	118.8	8.1
511 Total	eb	25344	25872	984+27	989+55	6335	296	0	0	226	0	0	0	0	0	669	882	8	0	0	0	0	10.56%	22.16%	0.13%	0.20	0.18	0.13	56.6	9.1	76.8	8.8
512 Total	eb	25872	26400	989+55	994+83	6335	890	0	0	379	0	0	0	0	0	298	851	0	0	0	0	0	4.70%	33.42%	0.00%	0.17	0.12	0.16	57.8	9.1	87.8	8.6
513 Total	eb	26400	26928	994+83	1000+11	6335	185	0	0	111	0	0	0	0	0	259	987	8	0	0	0	0	4.09%	19.94%	0.13%	0.18	0.13	0.16	57.2	9.1	93.2	8.5
514 Total	eb	26928	27456	1000+11	1005+39	6335	404	0	0	90	0	0	0	0	0	280	993	18	0	0	0	0	4.42%	22.53%	0.28%	0.15	0.15	0.10	66.6	8.9	104.2	8.3
515 Total	eb	27456	27984	1005+39	1010+67	6335	260	0	0	52	0	0	0	0	0	259	830	31	0	0	0	0	4.09%	17.87%	0.49%	0.18	0.16	0.13	74.0	8.8	120.4	8.1
516 Total	eb	27984	28512	1010+67	1015+95	6335	0	0	0	118	0	0	0	0	0	212	549	5	0	0	0	0	3.35%	12.11%	0.08%	0.16	0.16	0.10	75.4	8.8	95.1	8.5
517 Total	eb	28512	29040	1015+95	1021+23	6335	8	0	0	77	0	0	0	0	0	200	790	0	0	0	0	0	3.16%	13.81%	0.00%	0.18	0.14	0.15	67.3	8.9	87.2	8.6
518 Total	eb	29040	29568	1021+23	1026+51	6335	11	0	0	288	0	0	0	0	0	166	779	5	0	0	0	0	2.62%	17.02%	0.08%	0.23	0.21	0.17	68.2	8.9	99.7	8.4
519 Total	eb	29568	30096	1026+51	1031+79	6335	70	0	0	690	0	0	0	0	0	62	847	11	0	0	0	0	0.98%	22.21%	0.17%	0.17	0.15	0.12	76.1	8.8	101.8	8.4
520 Total	eb	30096	30624	1031+79	1037+07	6335	26	0	0	0	0	0	0	0	0	265	781	33	0	0	0	0	4.18%	12.74%	0.52%	0.19	0.19	0.08	57.5	9.1	99.7	8.4
521 Total	eb	30624	31152	1037+07	1042+35	6335	0	0	0	235	0	0	0	0	0	186	883	0	0	0	0	0	2.94%	17.85%	0.00%	0.23	0.19	0.18	57.6	9.1	92.7	8.5
522 Total	eb	31152	31680	1042+35	1047+63	6335	72	0	0	179	0	0	0	0	0	122	554	0	0	0	0	0	1.93%	12.87%	0.00%	0.20	0.20	0.09	53.4	9.1	84.5	8.6
523 Total	eb	31680	32208	1047+63	1052+91	6335	16	0	0	115	0	0	0	0	0	77	737	0	0	0	0	0	1.22%	13.70%	0.00%	0.22	0.22	0.11	56.4	9.1	100.7	8.4
524 Total	eb	32208	32736	1052+91	1058+19	6335	11	0	0	0	0	0	0	0	0	159	562	0	0	0	0	0	2.51%	9.04%	0.00%	0.24	0.22	0.14	57.2	9.1	75.1	8.8
525 Total	eb	32736	33264	1058+19	1063+47	6335	0	0	0	0	0	0	0	0	0	307	549	0	0	0	0	0	4.85%	8.67%	0.00%	0.23	0.18	0.20	61.0	9.0	79.3	8.7
526 Total	eb	33264	33792	1063+47	1068+75	6335	40	0	0	0	0	0	0	0	0	215	297	0	0	0	0	0	3.39%	5.32%	0.00%	0.23	0.20	0.20	53.1	9.1	72.8	8.8
527 Total	eb	33792	34320	1068+75	1074+03	6335	0	0	0	0	0	0	0	0	0	161	308	0	0	0	0	0	2.54%	4.86%	0.00%	0.21	0.18	0.17	58.8	9.1	76.3	8.8
528 Total	eb	34320	34848	1074+03	1079+31	6335	87	0	0	61	0	0	0	0	0	82	583	0	0	0	0	0	1.29%	13.12%	0.00%	0.23	0.22	0.15	48.7	9.2	76.9	8.8
529 Total	eb	34848	35376	1079+31	1084+59	6335	28	0	0	0	0	0	0	0	0	98	596	0	0	0	0	0	1.55%	9.85%	0.00%	0.18	0.16	0.12	51.9	9.2	96.4	8.5
530 Total	eb	35376	35904	1084+59	1089+87	6335	0	0	0	48	0	0	0	0	0	413	821	0	0	0	0	0	6.52%	13.72%	0.00%	0.20	0.19	0.10	48.0	9.2	84.8	9.0
531 Total	eb	35904	36432	1089+87	1095+15	6335	110	0	0	500	0	0	0	0	0	352	758	0	0	0	0	0	5.56%	21.59%	0.00%	0.28	0.19	0.24	58.8	9.1	58.3	9.1

Tamiami Trail Surface Distress Data - 1/10 Mile Summary
From Infrastructure Management Systems

Object	Direction	Beg Sta	End Sta	Begin Station	End Station	AREA(ft2)	All-NWP-I	All-NWP-II	All-NWP-S	All-WP-I	All-WP-II	All-WP-S	BLK-I	BLK-II	BLK-III	LONG-I	LONG-II	LONG-III	LONG-S	RAVEL-L	RAVEL-M	RAVEL-H	%CL-I	%CL-II	%CL-III	rut_hd_ln	rut_rght	rut_left	iri_r	fdotride_r	iri_l	fdotRide_l
532 Total	eb	36432	36960	1095+15	1100+43	6335	0	0	0	219	0	0	0	0	0	183	1006	0	0	0	0	0	2.89%	19.81%	0.00%	0.23	0.21	0.17	58.1	9.1	78.9	8.7
533 Total	eb	36960	37488	1100+43	1105+71	6335	3	0	0	506	0	0	0	0	0	486	635	0	0	0	0	0	7.67%	18.06%	0.00%	0.26	0.22	0.21	53.0	9.1	71.0	8.9
534 Total	eb	37488	38016	1105+71	1110+99	6335	0	0	0	459	0	0	0	0	0	877	687	5	0	0	0	0	13.84%	21.25%	0.08%	0.22	0.21	0.14	54.7	9.1	74.4	8.8
535 Total	eb	38016	38544	1110+99	1116+27	6335	0	0	0	0	0	0	0	0	0	311	692	0	0	0	0	0	4.91%	10.92%	0.00%	0.25	0.18	0.23	48.2	9.2	68.9	8.9
536 Total	eb	38544	39072	1116+27	1121+55	6335	0	0	0	32	0	0	0	0	0	367	574	0	0	0	0	0	5.79%	9.57%	0.00%	0.24	0.20	0.20	49.8	9.2	60.6	9.0
537 Total	eb	39072	39600	1121+55	1126+83	6335	0	0	0	0	0	0	0	0	0	245	436	0	0	0	0	0	3.87%	6.88%	0.00%	0.24	0.19	0.20	53.5	9.1	63.5	9.0
538 Total	eb	39600	40128	1126+83	1132+11	6335	0	0	0	0	0	0	0	0	0	57	543	0	0	0	0	0	0.90%	8.57%	0.00%	0.20	0.18	0.15	50.6	9.2	68.8	8.9
539 Total	eb	40128	40656	1132+11	1137+39	6335	54	0	0	0	0	0	0	0	0	215	672	0	0	0	0	0	3.39%	11.46%	0.00%	0.22	0.14	0.22	43.5	9.3	55.0	9.1
540 Total	eb	40656	41184	1137+39	1142+67	6335	0	0	0	38	0	0	0	0	0	516	757	0	0	0	0	0	8.15%	12.55%	0.00%	0.22	0.20	0.18	50.8	9.2	77.7	8.8
541 Total	eb	41184	41712	1142+67	1147+95	6335	0	0	0	29	0	0	0	0	0	78	546	0	0	0	0	0	1.23%	9.06%	0.00%	0.25	0.17	0.20	75.9	8.8	98.3	8.4
542 Total	eb	41712	42240	1147+95	1153+23	6335	0	0	0	23	0	0	0	0	0	92	591	0	0	0	0	0	1.45%	9.69%	0.00%	0.22	0.18	0.19	61.5	9.0	78.4	8.7
543 Total	eb	42240	42768	1153+23	1158+51	6335	8	0	0	0	0	0	0	0	0	28	678	0	0	0	0	0	0.44%	10.83%	0.00%	0.23	0.15	0.23	47.8	9.2	81.1	8.7
544 Total	eb	42768	43296	1158+51	1163+79	6335	18	0	0	0	0	0	0	0	0	193	568	0	0	0	0	0	3.05%	9.26%	0.00%	0.25	0.16	0.23	63.2	9.0	80.8	8.7
545 Total	eb	43296	43824	1163+79	1169+07	6335	3	0	0	104	0	0	0	0	0	198	481	0	0	0	0	0	3.13%	9.28%	0.00%	0.25	0.22	0.20	68.2	8.9	73.6	8.8
546 Total	eb	43824	44352	1169+07	1174+35	6335	620	0	0	0	0	0	0	0	0	456	406	0	0	0	0	0	7.20%	16.20%	0.00%	0.24	0.20	0.20	73.3	8.8	86.4	8.6
547 Total	eb	44352	44880	1174+35	1179+63	6335	51	0	0	72	0	0	0	0	0	231	656	0	0	0	0	0	3.65%	12.30%	0.00%	0.25	0.23	0.16	73.5	8.8	102.4	8.4
548 Total	eb	44880	45408	1179+63	1184+91	6335	22	0	0	0	0	0	0	0	0	344	625	10	0	0	0	0	5.43%	10.21%	0.16%	0.31	0.29	0.25	68.8	8.9	94.0	8.5
549 Total	eb	45408	45936	1184+91	1190+19	6335	0	0	0	0	0	0	0	0	0	371	831	0	0	0	0	0	5.86%	13.12%	0.00%	0.28	0.27	0.21	80.1	8.7	105.4	8.3
550 Total	eb	45936	46464	1190+19	1195+47	6335	8	0	0	61	0	0	0	0	0	423	760	0	0	0	0	0	6.68%	13.09%	0.00%	0.27	0.26	0.19	63.7	9.0	90.8	8.6
551 Total	eb	46464	46992	1195+47	1200+75	6335	0	0	0	0	0	0	0	0	0	551	644	0	0	0	0	0	8.70%	10.17%	0.00%	0.30	0.29	0.24	71.6	8.9	100.1	8.4
552 Total	eb	46992	47520	1200+75	1206+03	6335	0	0	0	0	0	0	0	0	0	372	933	0	0	0	0	0	5.87%	14.73%	0.00%	0.32	0.24	0.30	87.4	8.6	103.1	8.4
553 Total	eb	47520	48048	1206+03	1211+31	6335	0	0	0	48	0	0	0	0	0	308	984	0	0	0	0	0	4.86%	15.29%	0.00%	0.36	0.25	0.34	67.3	8.9	86.8	8.6
554 Total	eb	48048	48576	1211+31	1216+59	6335	85	0	0	115	0	0	0	0	0	168	1051	0	0	0	0	0	2.65%	19.75%	0.00%	0.42	0.26	0.42	77.6	8.8	77.8	8.8
555 Total	eb	48576	49104	1216+59	1221+87	6335	19	0	0	249	0	0	0	0	0	493	985	0	0	0	0	0	7.78%	19.78%	0.00%	0.28	0.19	0.26	79.7	8.7	104.7	8.3
556 Total	eb	49104	49632	1221+87	1227+15	6335	109	0	0	83	0	0	0	0	0	207	749	11	0	0	0	0	3.27%	14.54%	0.17%	0.21	0.19	0.16	69.4	8.9	103.5	8.4
557 Total	eb	49632	50160	1227+15	1232+43	6335	320	0	0	206	0	0	0	0	0	25	304	0	0	0	0	0	0.39%	14.52%	0.00%	0.20	0.18	0.14	70.8	8.9	100.1	8.4
558 Total	eb	50160	50688	1232+43	1237+71	6335	0	0	0	0	0	0	0	0	0	0	569	0	0	0	0	0	0.00%	8.98%	0.00%	0.18	0.16	0.11	61.0	9.0	87.1	8.5
559 Total	eb	50688	51216	1237+71	1242+99	6335	42	0	0	0	0	0	0	0	0	0	383	0	0	0	0	0	0.00%	6.71%	0.00%	0.19	0.16	0.16	69.0	8.9	88.1	8.6
560 Total	eb	51216	51744	1242+99	1248+27	6335	229	0	0	0	0	0	0	0	0	59	316	0	0	0	0	0	0.93%	8.60%	0.00%	0.29	0.23	0.28	61.3	9.0	73.6	8.8
561 Total	eb	51744	52272	1248+27	1253+55	6335	0	0	0	0	0	0	0	0	0	105	391	0	0	0	0	0	1.66%	8.17%	0.00%	0.33	0.21	0.33	56.5	9.1	67.1	8.9
562 Total	eb	52272	52800	1253+55	1258+83	6335	0	0	0	0	0	0	0	0	0	69	908	0	0	0	0	0	1.09%	9.57%	0.00%	0.24	0.21	0.20	59.1	9.0	79.6	8.7
563 Total	eb	52800	53328	1258+83	1264+11	6335	232	0	0	32	0	0	0	0	0	77	837	0	0	0	0	0	1.22%	17.38%	0.00%	0.18	0.18	0.06	72.2	8.8	104.8	8.3
564 Total	eb	53328	53856	1264+11	1269+39	6335	0	0	0	0	0	0	0	0	0	92	817	0	0	0	0	0	1.45%	12.90%	0.00%	0.25	0.24	0.14	64.4	9.0	90.4	8.6
565 Total	eb	53856	54384	1269+39	1274+67	6335	0	0	0	0	0	0	0	0	0	83	634	0	0	0	0	0	1.31%	10.01%	0.00%	0.22	0.22	0.10	54.4	9.1	78.3	8.7
566 Total	eb	54384	54912	1274+67	1279+95	6335	0	0	0	0	0	0	0	0	0	180	596	0	0	0	0	0	2.84%	9.41%	0.00%	0.24	0.22	0.14	79.8	8.7	101.0	8.4
567 Total	eb	54912	55440	1279+95	1285+23	6335	0	0	0	0	0	0	0	0	0	374	365	0	0	0	0	0	5.90%	5.76%	0.00%	0.24	0.21	0.18	63.2	9.0	79.9	8.7
568 Total	eb	55440	55968	1285+23	1290+51	6335	74	0	0	0	0	0	0	0	0	10	513	0	0	0	0	0	0.16%	8.27%	0.00%	0.23	0.20	0.17	75.2	8.8	85.4	8.6
569 Total	eb	55968	56496	1290+51	1295+79	6335	0	0	0	0	0	0	0	0	0	8	188	0	0	0	0	0	0.13%	2.97%	0.00%	0.21	0.12	0.20	70.9	8.9	93.1	8.5
570 Total	eb	56496	57024	1295+79	1301+07	6335	0	0	0	48	0	0	0	0	0	135	86	0	0	0	0	0	2.13%	2.12%	0.00%	0.19	0.08	0.19	49.7	9.2	64.2	9.0
571 Total	eb	57024	57352	1301+07	1304+35	3932	0	0	0	0	0	0	0	0	0	0	55	0	0	0	0	0	0.00%	1.40%	0.00%	0.25	0.07	0.24	68.6	8.9	108.6	8.3
Average							139.3	0.2	0.0	284.2	3.1	0.0	0.0	0.0	0.0	343.1	738.5	5.1	0.0	0.0	0.0	0.0	5.4%	18.3%	0.1%	0.24	0.20	0.19	67.04	8.9	92.43	8.5
Max							1038.0	24.0	0.0	1683.0	222.0	0.0	0.0	0.0	0.0	1057.0	1075.0	54.0	0.0	0.0	0.0	0.0	16.7%	51.7%	3.5%	0.42	0.31	0.42	125.81	9.3	160.94	9.1
Min							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	0.0%	0.0%	0.14	0.07	0.06	43.63	8.0	55.03	7.5
Median							42.0	0.0	0.0	71.0	0.0	0.0	0.0	0.0	0.0	298.0	779.0	0.0	0.0	0.0	0.0	0.0	4.7%	15.8%	0.0%	0.24	0.20	0.19	65.44	8.9	92.32	8.5
Mode							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	851.0	0.0	0.0	0.0	0.0	0.0	0.0%	13.1%	0.0%	0.24	0.19	0.19	67.25	9.0	#N/A	#N/A
Standard Deviation							218.8	2.3	0.0	396.9	22.2	0.0	0.0	0.0	0.0	273.1	233.6	12.9	0.0	0.0	0.0	0.0	4.3%	10.7%	0.4%	0.05	0.05	0.06	13.99	0.2	18.67	0.3

Tamiami Trail Centerline Elevation Data (Lowest to Highest)

10.06 C/L OF ROAD
10.06 C/L OF ROAD
10.24 C/L OF ROAD
10.38 C/L OF ROAD
10.39 C/L ROAD
10.4 C/L OF ROAD
10.4 C/L ROAD
10.46 C/L OF ROAD
10.46 C/L OF ROAD
10.46 C/L OF ROAD
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11.42 C/L OF ROAD
11.42 C/L OF ROAD
11.44 C/L ROAD
11.45 C/L OF ROAD
11.47 C/L OF ROAD
11.61 C/L OF ROAD
11.77 C/L OF ROAD
11.78 C/L
11.84 C/L OF ROAD
11.87 C/L OF ROAD
11.9 C/L OF ROAD
11.92 C/L OF ROAD

10.94827	Average
11.92	Max
10.06	Min

SOURCE: PBS&J SURVEY.
11/20/00

PBS&J

COMP. BY: mj
CHK. BY:
DATE: 11/30/00
SHEET NO:
JOB NO:

SUBJECT: LEVEE ELEVATIONS

Source: Cross Sections Cut for Working Meeting in October. Maximum elevations on the levee. Developed from TIN developed from PBSJ Survey.

WEST	17.2
	16.5
	17.1
	16.6
	18.1
	21.0
	18.0
	15.1
	16.2
EAST	15.4

(10 each)

Avg = 17.12
MAX = 21.0
MIN = 15.1

Note: Elevations were not determined for 3 sections because of insufficient data.

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▸ 5

To Ralph Bingham	From C. Smith
Dept./Agency PBS&J	Phone # 904-232-2781
Fax # 407-647-4143	Fax # 904-232-1772

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Christopher T Smith

11/02/2000 08:49 AM

To: rlbingham@pbsj.com@exchange
cc:
Subject: L-29 Canal Data S333 & S334

Ralph -

Attached are data for L-29 canal as requested (ascii). S-333 tailwater is the western elevation and S-334 is the east elevation. You can interpolate between the reading to determine the stage at the boring locations.

Chris

-------------------- Forwarded by Christopher T Smith/CESAJ/SAJ02 on 11/02/2000 08:47 AM ---------------------------

Gregory A Stormant
11/02/2000 08:34 AM

To: Christopher T Smith/CESAJ/SAJ02@CESAJ
cc:
Subject: S333 & S334

As requested,

S333 Tailwater: June - July 2000

s333_tw.asc

S334 Headwater: June - July 2000

s334_hw.asc

Aaron

RECEIVED
TRANSPORTATION DESIGN
NOV 07 2000
PBS.J. INC.-WINTER PARK
R. Bingham
FILE

Water fork from Ralph Info. 11/8/00

Same cell
Should be even
average between 2

WEST

/E COAST CANALS/S333/ELEV-TAIL//1DAY//
RTS Ver:999 Prog:DSSMAT LW:02NOV00 07:32:06 Tag:T14295 Prec:0
Start: 31MAY2000 at 2400 hours; End: 01AUG2000 at 2400 hours; Number: 63
Units: FT-NGVD Type: INST-VAL

31MAY2000, 2400;	7.03
01JUN2000, 2400;	6.93
02JUN2000, 2400;	6.91
03JUN2000, 2400;	6.89
04JUN2000, 2400;	6.88
05JUN2000, 2400;	6.87
06JUN2000, 2400;	6.97
07JUN2000, 2400;	6.95
08JUN2000, 2400;	6.91
09JUN2000, 2400;	7.03
10JUN2000, 2400;	7.01
11JUN2000, 2400;	7.07
12JUN2000, 2400;	7.10
13JUN2000, 2400;	7.09
14JUN2000, 2400;	7.07
15JUN2000, 2400;	7.31
16JUN2000, 2400;	-901.00
17JUN2000, 2400;	-901.00
18JUN2000, 2400;	7.28
19JUN2000, 2400;	7.28
20JUN2000, 2400;	7.29
21JUN2000, 2400;	7.29
22JUN2000, 2400;	7.15
23JUN2000, 2400;	7.15
24JUN2000, 2400;	7.24
25JUN2000, 2400;	7.20
26JUN2000, 2400;	7.25
27JUN2000, 2400;	7.28
28JUN2000, 2400;	7.21
29JUN2000, 2400;	7.20
30JUN2000, 2400;	7.19
01JUL2000, 2400;	7.18
02JUL2000, 2400;	7.19
03JUL2000, 2400;	7.25
04JUL2000, 2400;	7.25
05JUL2000, 2400;	7.26
06JUL2000, 2400;	7.27
07JUL2000, 2400;	7.35
08JUL2000, 2400;	7.29
09JUL2000, 2400;	7.30
10JUL2000, 2400;	7.33
11JUL2000, 2400;	7.32
12JUL2000, 2400;	7.32
13JUL2000, 2400;	7.30
14JUL2000, 2400;	7.29
15JUL2000, 2400;	7.30
16JUL2000, 2400;	7.28
17JUL2000, 2400;	7.17
18JUL2000, 2400;	7.11
19JUL2000, 2400;	7.07
20JUL2000, 2400;	7.07
21JUL2000, 2400;	7.13

22JUL2000, 2400;	7.16
23JUL2000, 2400;	7.17
24JUL2000, 2400;	7.19
25JUL2000, 2400;	7.12
26JUL2000, 2400;	7.09
27JUL2000, 2400;	7.06
28JUL2000, 2400;	7.03
29JUL2000, 2400;	7.04
30JUL2000, 2400;	7.03
31JUL2000, 2400;	6.99
01AUG2000, 2400;	6.99

END FILE

EAST

/E COAST CANALS/S334/ELEV-HEAD//1DAY//
RTS Ver:999 Prog:~~DSS~~MAT LW:02NOV00 07:32:06 Tag:T14296 Prec:0
Start: 31MAY2000 at 2400 hours; End: 01AUG2000 at 2400 hours; Number: 63
Units: FT-NGVD Type: INST-VAL

31MAY2000, 2400;	7.21
01JUN2000, 2400;	7.14
02JUN2000, 2400;	7.14
03JUN2000, 2400;	7.10
04JUN2000, 2400;	7.09
05JUN2000, 2400;	7.07
06JUN2000, 2400;	7.11
07JUN2000, 2400;	7.13
08JUN2000, 2400;	7.14
09JUN2000, 2400;	7.21
10JUN2000, 2400;	7.19
11JUN2000, 2400;	7.24
12JUN2000, 2400;	7.29
13JUN2000, 2400;	7.27
14JUN2000, 2400;	7.26
15JUN2000, 2400;	7.47
16JUN2000, 2400;	-901.00
17JUN2000, 2400;	-901.00
18JUN2000, 2400;	7.47
19JUN2000, 2400;	7.48
20JUN2000, 2400;	7.49
21JUN2000, 2400;	7.47
22JUN2000, 2400;	7.36
23JUN2000, 2400;	7.35
24JUN2000, 2400;	7.38
25JUN2000, 2400;	7.39
26JUN2000, 2400;	7.43
27JUN2000, 2400;	7.44
28JUN2000, 2400;	7.40
29JUN2000, 2400;	7.41
30JUN2000, 2400;	7.38
01JUL2000, 2400;	7.38
02JUL2000, 2400;	7.45
03JUL2000, 2400;	7.44
04JUL2000, 2400;	7.46
05JUL2000, 2400;	7.45
06JUL2000, 2400;	7.46
07JUL2000, 2400;	7.53
08JUL2000, 2400;	7.49
09JUL2000, 2400;	7.49
10JUL2000, 2400;	7.52
11JUL2000, 2400;	7.52
12JUL2000, 2400;	7.51
13JUL2000, 2400;	7.51
14JUL2000, 2400;	7.48
15JUL2000, 2400;	7.48
16JUL2000, 2400;	7.47
17JUL2000, 2400;	7.37
18JUL2000, 2400;	7.31
19JUL2000, 2400;	7.27
20JUL2000, 2400;	7.26
21JUL2000, 2400;	7.32

22JUL2000, 2400;	7.35
23JUL2000, 2400;	7.38
24JUL2000, 2400;	7.34
25JUL2000, 2400;	7.31
26JUL2000, 2400;	7.29
27JUL2000, 2400;	7.25
28JUL2000, 2400;	7.22
29JUL2000, 2400;	7.24
30JUL2000, 2400;	7.20
31JUL2000, 2400;	7.17
01AUG2000, 2400;	7.16

END FILE

Appendix C-4 – Pavement Design Calculations

Steps in Determining Pavement Thickness:

1. Traffic- ESAL Calculation
2. Mr of the Subgrade
3. Determine Other design variables
4. Complete pavement thickness design.

NOTE: All references in the pavement design process are from the *Florida DOT Flexible Pavement Design Manual*, January 2000.

Step 1- Traffic

1. Traffic-ESAL Calculation
2. Florida DOT ESAL Equations from Florida DOT Pavement Design Manual

PBSJ

COMP. BY: MJ
CHK. BY:
DATE: 8/9/00
SHEET NO:
JOB NO:

SUBJECT: TAMIAMI TRAIL - TRAFFIC

DESIGN TRAFFIC

AADT = 5,200 veh/day
% TRUCKS = 11

FROM "PERTINENT DATA"

(also ref. J. Schnettler E-Mail, 5/11/00 - See attached).

% Growth: (Assumed) - changed to 2.2% for 50 years (see graph)

See below

Truck Classification: 3.680% → ~~18 wheel~~ 4% → 18 wheel
\# 10% → SU
Cars 86% → Cars

Growth: assume Traffic Doubles to 10,000 AADT by 2050

Design AADT =	20	-	3.3 Million ESALS
(FROM "DESIGN TRAFFIC	30	-	5.6 M
AND ESALS CHART")	50	-	11.7 M

NOTE: 2.2% Growth used because if 4.66% is used, the Traffic in 50 years WILL BE MORE THAN THE 2-LANE ROAD CAN ACCOMMODATE. SEE "TAMIAMI TRAIL TRAFFIC GROWTH" CHART FOR A COMPARISON.

Form No. 5100/98

TAMIAMI TRAIL
MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK

PERTINENT DATA

US 41/TAMIAMI TRAIL

West Project Limit	S-333 Sta. 580+46 on Levee 29
East Project Limit	S-334 Sta. 15+26 on Levee 29
Florida Dept. of Transportation State Route No.	S.R. 90
Florida Dept. of Transportation Section No.	870003
Florida Dept. of Transportation Functional Classification	Rural Arterial
Roadway Design Speed	60 mph
Roadway Posted Speed Limit	55 mph
Number of Existing Travel Lanes	2
Number of Future Travel Lanes	2
Existing Average Daily Traffic (1999)	5,200 vehicles
Projected Average Daily Traffic (2022)	9,200
Percent Heavy Trucks	11.47%
Peak Hour to Daily Traffic Ratio	9.29%
Directional Distribution Facor	52.66%
Corridor Length	56,520 feet/ 10.7 miles
Datum	NGVD 29
Design Stage Upstream of L-29 Borrow Canal	10.5 feet
Design Stage at L-29 Borrow Canal	9.0 feet
Design State Downstream of US 41/Tamiami Trail	9.0 feet
Contract Price	
Alt. 1: Existing Alignment and Profile with Four New Bridges	$ 13,471,981
Alt. 2: Existing Alignment with Raised Profile and	
Four New Bridges: Without Water Quality Treatment	$ 23,387,038
With Water Quality Treatment	$ 39,093,978
Alt. 3: New North Alignment with Raised Profile and	
Four New Bridges: Without Water Quality Treatment	$ 55,119,470
With Water Quality Treatment	$ 56,205,969
Alt. 4: New South Alignment with Raised Profile and	
Four New Bridges: Without Water Quality Treatment	$ 29,943,240
With Water Quality Treatment	$ 31,536,767
Alt. 5: New Alignment on Structure	$ 119,356,002

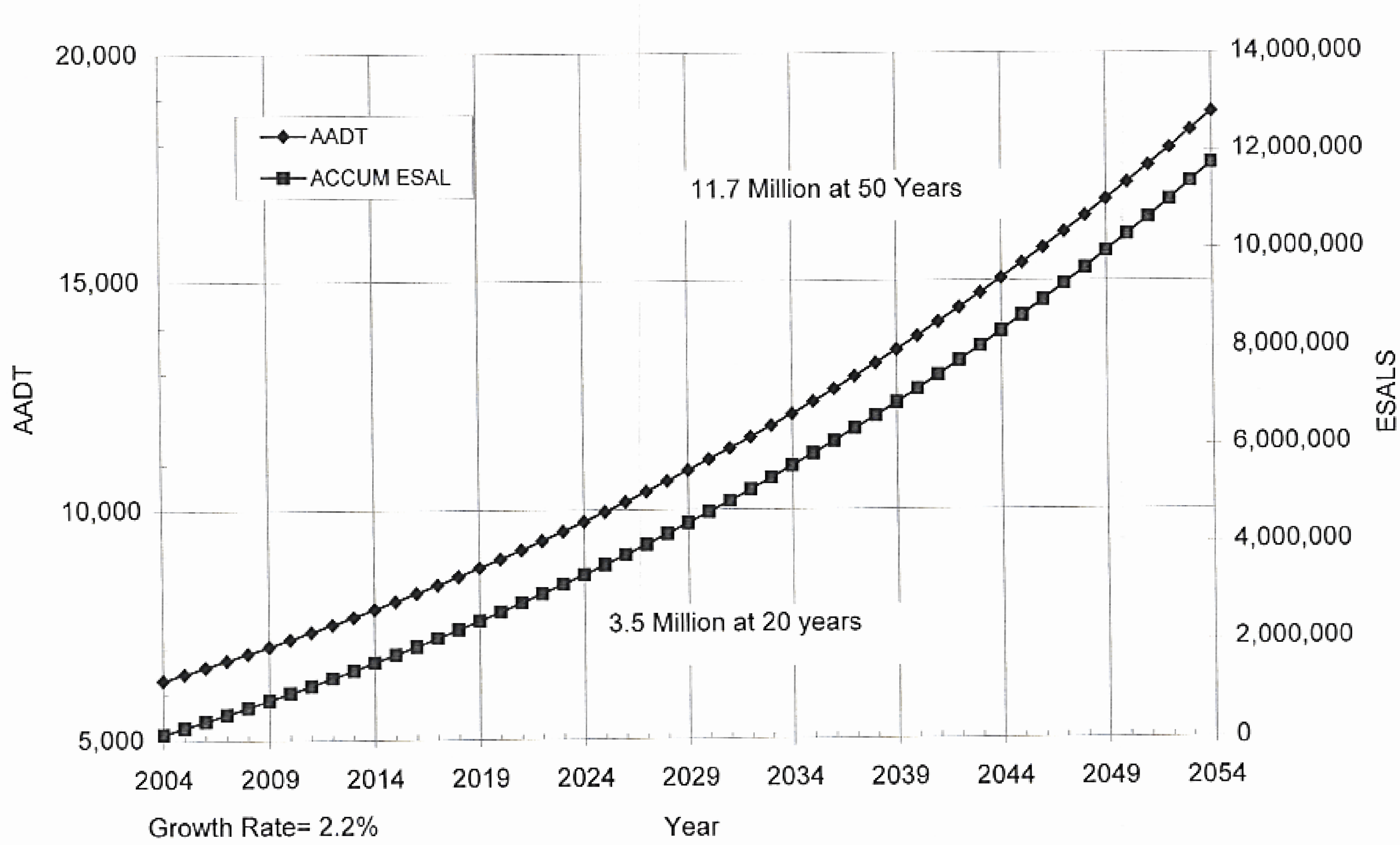
PAVEMENT/
ESAL
CALC.
DATA

Jansen, Mark C.

From: Schnettler, Jack S.
Sent: Tuesday, May 16, 2000 11:58 AM
To: Anderson, John R.; Jansen, Mark C.
Cc: Yerkes, Eugene H.

Tamiami Trail has about 5,200 daily vehicles on it, with a 9.2% peak hour percentage and 11% trucks, according to an FDOT count just west of Krome Ave. This means the peak hour has about 460 vehicles in the peak hour, about 250 in the peak direction, or 1 about every 4 minutes each way on the average. Beyond that, we would need to talk to FDOT on closure procedures, or make assumptions. Maybe do the estimate worst case and "average" and include worst case in the table. I'm awaiting feedback from Gene Yerkes.

Design Traffic and ESALS



Tamiami Trail Alternatives Study
Traffic data for design- used to construct Design Traffic and ESALS Chart
Based on Florida DOT Pavement design information.

Df	0.5		
T24	11.5%	1999 AADT	5200
LF	1.0		
E18	0.96		
Growth	2.2%		

Year	AADT	ESAL	ACCUM ESAL	
2004	6,400	128,947	128,947	
2005	6,541	131,784	260,731	
2006	6,685	134,683	395,415	
2007	6,832	137,646	533,061	
2008	6,982	140,675	673,735	
2009	7,136	143,769	817,505	
2010	7,293	146,932	964,437	
2011	7,453	150,165	1,114,602	
2012	7,617	153,468	1,268,070	
2013	7,785	156,845	1,424,915	
2014	7,956	160,295	1,585,210	
2015	8,131	163,822	1,749,032	
2016	8,310	167,426	1,916,458	
2017	8,493	171,109	2,087,567	
2018	8,679	174,874	2,262,441	
2019	8,870	178,721	2,441,162	
2020	9,066	182,653	2,623,815	
2021	9,265	186,671	2,810,486	
2022	9,469	190,778	3,001,264	
2023	9,677	194,975	3,196,239	
2024	9,890	199,264	3,395,503	20 Years
2025	10,108	203,648	3,599,152	
2026	10,330	208,129	3,807,280	
2027	10,557	212,707	4,019,987	
2028	10,790	217,387	4,237,374	
2029	11,027	222,169	4,459,544	
2030	11,269	227,057	4,686,601	
2031	11,517	232,052	4,918,653	
2032	11,771	237,158	5,155,811	
2033	12,030	242,375	5,398,186	
2034	12,294	247,707	5,645,893	30 Years
2035	12,565	253,157	5,899,050	
2036	12,841	258,726	6,157,776	
2037	13,124	264,418	6,422,195	
2038	13,413	270,235	6,692,430	
2039	13,708	276,181	6,968,611	
2040	14,009	282,257	7,250,867	
2041	14,317	288,466	7,539,334	
2042	14,632	294,813	7,834,146	
2043	14,954	301,298	8,135,445	
2044	15,283	307,927	8,443,372	
2045	15,619	314,701	8,758,073	
2046	15,963	321,625	9,079,698	
2047	16,314	328,701	9,408,398	
2048	16,673	335,932	9,744,330	
2049	17,040	343,322	10,087,653	
2050	17,415	350,876	10,438,528	
2051	17,798	358,595	10,797,123	
2052	18,190	366,484	11,163,607	
2053	18,590	374,547	11,538,154	
2054	18,999	382,787	11,920,940	50 Years

Summary:

20- Years	3,395,503
30- Years	5,645,893
50-Years	11,920,940

Florida Department of Transportation
Annual Vehicle Classification Report
Count Year 1997

County: 87 - DADE

Site	Co Sec Sub	MilePost	Description
0003	87110000	25.660	SR90/US41/TAMIAMI TRL, 200'W OF SR997/KROMEAV,DADE

Func. Class: 02 - Rural Principal Arterial -- Other

Survey Type: Portable   Duration: 1 Days

		Annual Average Daily Volume	%	
Light Pax	Class 01 MOTORCYCLES	55	1.24	87.05%
	Class 02 CARS	3033	68.93	
	Class 03 PICK-UPS AND VANS	743	16.88	
	Class 04 BUSES	4	0.09	9.27%
	Class 05 2-AXLE, SINGLE UNIT TRUCKS	74	1.68	
	Class 06 3-AXLE, SINGLE UNIT TRUCKS	164	3.73	
	Class 07 4-AXLE, SINGLE UNIT TRUCKS	58	1.31	
	Class 08 2-AXL TRCTR W/ 1 OR 2-AXL TRLR	108	2.46	
LARGE	Class 09 3-AXLE TRACTOR W/ 2-AXLE TRLR	135	3.07	3.68%
	Class 10 3-AXLE TRACTOR W/ 3-AXLE TRLR	6	0.13	
	Class 11 5-AXLE MULTI-TRLR	11	0.24	
	Class 12 6-AXLE MULTI-TRLR	1	0.02	
	Class 13 ANY 7 OR MORE AXLE	10	0.22	
	Class 14 NOT USED	0	0.00	
	Class 15 OTHER	0	0.00	
		4400	100.00	

Summary Daily Statistics

Daily	Design Hour
24T&B = 12.94%	DHT = 6.47%
24T = 12.85%	
24H = 11.18%	DH3 = 5.59%
24M = 1.76%	DH2 = 0.88%

TABLE 3.1

DESIGN PERIODS

The Following Design Periods Will Be Used For Flexible Pavement Designs.

TYPICAL FDOT New Construction or Reconstruction	20 Years
Pavement Overlay Without Milling	8 to 20 Years
Pavement Overlay With Milling	
Limited Access	12 to 20 Years*
Non-Limited Access	14 to 20 Years*
Pavement Overlay of Rigid Pavement	8 to 12 Years

Notes

* Shorter design periods can be used if there are constraints such as curb and gutter or scheduled future capacity projects that justify limiting overlay thickness. These reasons should be documented in the pavement design package.

D.2 BASIC EQUATION

The $ESAL_D$ required for pavement design purposes can be computed using the following equation:

$$ESAL_D = \sum_{y=1}^{y=x} (AADT \times T_{24} \times D_F \times L_F \times E_{18} \times 365)$$

where:

$ESAL_D$ = Number of accumulated 18-kip(80-kilonewton)Equivalent Single Axle Loads in the design lane for the design period.

y = The year that the calculation is made for. When y=1, all the variables apply to year 1. Most of the variables are constant except AADT which may change from year to year. Others may change when changes in the system occur. Such changes include parallel roads, shopping centers, truck terminals, etc.

x = The Design Year.

AADT = Average Annual Daily Traffic.

T_{24} = Percent Heavy Trucks during a 24 hour period. Trucks with 6 tires or more are considered in the calculations.

D_F = Directional Distribution Factor. Use 1.0 if one way traffic is counted or 0.5 for two way traffic. This value is not to be confused with the Directional Factor use for planning capacity computations.

L_F = Lane Factor converts directional trucks to the design lane trucks. Lane factors can be adjusted to account for unique features known to the designer such as roadways with designated truck lanes. L_F values can be determined from Table D.2.

E_{18} = Equivalency factor which is the damage caused by one average heavy truck measured in 80-kilonewtons Equivalent Single Axle Loads. These factors will be periodically updated based on Weigh-In-Motion (WIM) data. E_{18}(E_{80} values can be determined from Table D.3.

TABLE D.3

EQUIVALENCY FACTORS E_{18} (E_{80}) FOR DIFFERENT TYPES OF FACILITIES

	Flexible Pavement	Rigid Pavement
Freeways		
Rural	1.05	1.60
Urban	0.90	1.27
Arterials and Collectors		
Rural	0.96	1.35
Urban	0.89	1.22

USE FOR TAMIAMI TRAIL = $E_{18} = E_F$ IN SPREADSHEET

TABLE D.2

LANE FACTORS (L_T) FOR DIFFERENT TYPES OF FACILITIES

Two-Way Annual

	Number of Lanes In One Direction	
Total AADT	Two Lanes L_T	Three or more Lanes L_T
4 000	0.94	0.82
8 000	0.88	0.76
12 000	0.85	0.72
16 000	0.82	0.70
20 000	0.81	0.68
30 000	0.77	0.65
40 000	0.75	0.63
50 000	0.73	0.61
60 000	0.72	0.59
70 000	0.70	0.58
80 000	0.69	0.57
100 000	0.67	0.55
120 000	0.66	0.53
140 000	-	0.52
160 000	-	0.51
200 000	-	0.49

5200 = 0.922

use 1.0 for conservatism

The equation that best defines this Lane Factor (L_T) information is:

$$L_T = (1.567 - 0.0826 \times Ln(\text{One Way AADT}) - 0.12368 \times LV)$$

where:

L_T = Proportion of all one directional trucks in the design lane.

LV = 0 if the number of lanes in one direction is 2. LV = 1 if the number of lanes in one direction is 3 or more.

Ln = Natural Logarithm.

Source - National Cooperative Highway Research Program Report 277, Portland Cement Concrete Pavement Evaluation System (COPES), Transportation Research Board, September 1986

Design Traffic Notes:

The Corps of Engineers provided the following Florida DOT Memorandum to PBS&J, Dated May 5, 1999 with "Traffic Projection" as the subject.

Use of the 4.6% growth rate over 50 years causes a high AADT at the end of the 50-year period as shown in the following chart entitled "Tamiami Trail Traffic Growth." The AADT shown in 2054 exceeds that which can be accommodated by a 2-lane roadway. The 2.2% growth rate was agreed upon by J. Schnettler and the design team at the August 17, 2000 Design Session in Fort Lauderdale.

Traffic

Florida Department of Transportation

OFFICE OF PLANNING - DISTRICT SIX
602 SOUTH MIAMI AVENUE, MIAMI, FLORIDA 33130
PHONE: (305) 377-5910 (SC) 452-5910
FAX: (305) 377-5684 (SC) 452-5684

JEB BUSH
GOVERNOR

THOMAS F. BARRY, JR.
SECRETARY

MEMORANDUM

DATE: May 5, 1999

TO: Jorge Frases, Project Manager

FROM: Rolando Jiménez, Senior Systems Statistics Project Manager RJ

COPIES TO: Albert Dominguez, Bob Perez, Mike Ciscar, file

SUBJECT: **Traffic Projection:**
State Job No.: 87110-XXXX
FM No.: N/A
Budget Item No.: N/A
FAP No.: N/A
State Road No.: SR 90/US-27/Tamiami Trail
From: 11 miles W of SR 997/Krome Ave
To: SR 997/Krome Ave
County: Miami-Dade
Type of Construction: Reconstruction

In compliance with your request, attached is a computer printout showing the estimated projected AADT's and equivalent axle loading from the year of completion, 2002 to the year 2022. The Level of Services Standard for this facility according to LOS Rule 14-94 is "D". This section of road is operating at a Level of Service "C" or better.

The data provided assumes 2 lanes undivided, flexible pavement, and the following factors: K(30 hrs)= 9.29%, D=52.66%, and T= 11.47%.

These projections are based upon an estimated 4.66% growth rate determined from historical traffic count data.

If you have any questions, please advise.

RJ/rj
Attachments

18 kip EQUIVALENT SINGLE AXLE LOAD ANALYSIS - HISTORICAL

DISTRICTWIDE DESIGN TRAFFIC FOR PD&E and DESIGN ANALYSIS INFO / FACTORS

SECTION NO.: 87120000

SEGMENT NO.: 1

ITEM NO.:

PROJECT DESCRIPTION: SR 90/SW 8 Street/Tamiami Trail

LOCATION 1 DESCRIPTION: **LOCATION NO: 1**

From Krome Av. to 11 mi W. of Krome Av.

GROWTH RATE FORMULA:

A : Straight-Line
B : Enter Growth Rates
C : Enter all AADT's

Choose A,B or C here: C

If "A" or "C", continue to next section.

If "B", enter rates as decimals: (1%=0.01)

Between Existing & Opening - 0
Between Opening & Mid-Design - 0
Between Mid-Design & Design - 0

DESIGN INFORMATION:

	Year	AADT
EXISTING YEAR:	1999	5200
OPENING YEAR:	2002	6000
MID-DESIGN YEAR:	2012	7600
DESIGN YEAR:	2022	9200

Daily Directional Split (decimal format, 1%=0.01): 0.5

T (decimal format, 1%=0.01): 0.115

Lanes in One Direction: 1

NOTE: AADT values have been rounded to nearest hundred.

1995 EQUIVALENCY FACTORS (1):
(selected with an X)

	FLEXIBLE PAVEMENT SN = 5/THICK		RIGID PAVEMENT D = 12/THICK	
RURAL FREEWAY:	1.050		1.600	
URBAN FREEWAY:	0.900		1.270	
RURAL HIGHWAY:	0.960	X	1.350	
URBAN HIGHWAY:	0.890		1.220	
OTHER (enter factor & X):				

(1) Equivalency Factors are based on Updated Pavement Damage Factors Memorandum, dated October 1, 1998.
Lane Factors developed by Copes Equation

I have followed the "Design Traffic (Traffic Forecasting and 18-kip Equivalent Single Axle Loading) Procedure", adopted by the Florida Department of Transportation.

Prepared by: ____ (Signature) P. R. Aleman & Assoc. Inc. (Firm) 47785 (P.E. No.) 5/4/99 (Date)

I have reviewed the methodology used to derive the Design Traffic and 18 kip ESAL. I concur with the results.

Reviewed by: (FDOT) ____ (Signature) 5/5/99 (Date)

18 kip EQUIVALENT SINGLE AXLE LOAD ANALYSIS - LOCATION 1

DISTRICTWIDE DESIGN TRAFFIC FOR PD&E and DESIGN ANALYSIS INFO / FACTORS

YEARS 1999 TO 2022

SECT. NO. 87120000 SEG. NO.: 1 ITEM NO.:

FLEXIBLE PAVEMENT RURAL HIGHWAY 0.960

SN = 5/THICK From Krome Av. to 11 mi W. of Krome Av. C

YEAR	AADT	ESAL (1000)	ACCUM (1000)	D	T	LF	EF
1999	5200	105	0	0.5	0.115	1.000	0.960
2000	5500	111	0	0.5	0.115	1.000	0.960
2001	5700	116	0	0.5	0.115	1.000	0.960
2002	6000	121	121	0.5	0.115	1.000	0.960
2003	6200	124	245	0.5	0.115	1.000	0.960
2004	6300	127	372	0.5	0.115	1.000	0.960
2005	6500	131	503	0.5	0.115	1.000	0.960
2006	6600	134	637	0.5	0.115	1.000	0.960
2007	6800	137	774	0.5	0.115	1.000	0.960
2008	7000	140	914	0.5	0.115	1.000	0.960
2009	7100	143	1057	0.5	0.115	1.000	0.960
2010	7300	147	1204	0.5	0.115	1.000	0.960
2011	7400	150	1354	0.5	0.115	1.000	0.960
2012	7600	153	1507	0.5	0.115	1.000	0.960
2013	7800	156	1663	0.5	0.115	1.000	0.960
2014	7900	160	1823	0.5	0.115	1.000	0.960
2015	8100	163	1986	0.5	0.115	1.000	0.960
2016	8200	166	2152	0.5	0.115	1.000	0.960
2017	8400	169	2321	0.5	0.115	1.000	0.960
2018	8600	172	2494	0.5	0.115	1.000	0.960
2019	8700	176	2669	0.5	0.115	1.000	0.960
2020	8900	179	2848	0.5	0.115	1.000	0.960
2021	9000	182	3030	0.5	0.115	1.000	0.960
2022	9200	185	3216	0.5	0.115	1.000	0.960

3.2 # ESALS - Matches PGSS Closely w/in 100K

Opening to Mid-Design Year ESAL Accumulation (1000): 1386

Opening to Design Year ESAL Accumulation (1000): 3095

I have followed the "Design Traffic (Traffic Forecasting and 18 kip Equivalent Single Axle Loading) Procedure", adopted by the Florida Department of Transportation.

Prepared by: ________ F.R. Aleman & Assoc. Inc. 48165 5/4/99

Signature Firm P.E. No. Date

I have reviewed the methodology used to derive the Design Traffic and 18 kip ESAL / concur with the results.

Reviewed by: (FDOT) ________ 5/5/99

Signature Date

Table 5-6

GENERALIZED ANNUAL AVERAGE DAILY VOLUMES FOR FLORIDA'S RURAL UNDEVELOPED AREAS AND CITIES OR DEVELOPED AREAS LESS THAN 5,000 POPULATION*

RURAL UNDEVELOPED AREAS

FREEWAYS

Lanes	A	B	C	D	E
4	20,000	32,300	45,900	56,200	64,600
6	30,800	49,700	70,500	86,400	99,400
8	42,100	67,900	96,400	118,100	135,800

MULTILANE UNINTERRUPTED HIGHWAYS

Lanes/ Divided/Left Bays	A	B	C	D	E
4 Undiv/No Bays	14,200	23,800	32,200	38,300	43,000
4 Undiv/Bays	18,000	30,000	40,800	48,500	54,500
4 Div/Bays	18,900	31,500	43,000	51,000	57,300
6 Div/Bays	28,400	47,300	64,500	76,500	86,000

TWO-LANE UNINTERRUPTED HIGHWAYS

55 MPH POSTED SPEED

Lanes/ Left Turn Bays	A	B	C	D	E
2 No Bays	2,500	5,000	8,200	13,000	20,900
2 Bays	2,600	5,300	8,600	13,600	22,000

45 MPH POSTED SPEED

Lanes/ Left Turn Bays	A**	B	C	D	E
2 No Bays	N/A	2,400	6,400	10,700	20,100
2 Bays	N/A	2,500	6,800	11,200	21,200

EXCLUSIVE PASSING LANE ADJUSTMENTS

Percent of Miles with Exclusive Passing Lanes	Adjustment
60+	+37%
20-59	+27%
5-19	+17%
1-4	+5%

ISOLATED SIGNALIZED INTERSECTIONS

Lanes	A**	B	C	D	E
2 Lane / No Bays	N/A	1,200	6,600	9,300	10,100
2 Lane / Bays	N/A	1,500	8,400	11,700	12,800
4 Lane / No Bays	N/A	2,500	14,400	19,200	20,400
4 Lane / Bays	N/A	3,100	18,200	24,300	25,800

CITIES OR RURAL DEVELOPED AREAS LESS THAN 5,000 POPULATION

FREEWAYS

Lanes	A	B	C	D	E
4	21,000	32,300	45,900	58,200	64,600
6	30,800	49,700	70,500	88,400	99,400
8	42,100	67,900	96,400	118,100	136,800

INTERRUPTED FLOW ARTERIALS

Class Ia (up to 1.50 signalized intersections per mile)

Lanes/Divided/ /Bays	A	B	C	D***	E***
2 Undiv/No Bays	4,500	10,100	11,200	11,800	11,800
2 Undiv/Bays	5,700	12,800	14,200	15,000	15,000
2 Div/Bays	6,000	13,400	14,900	15,800	15,800
4 Undiv/No Bays	9,300	20,900	22,600	23,600	23,600
4 Undiv/Bays	11,600	26,400	28,600	29,900	29,900
4 Div/Bays	12,400	27,800	30,100	31,500	31,500
6 Div/Bays	18,700	42,400	45,300	47,300	47,300

Class Ib (more than 1.50 signalized intersections per mile)

Lanes/Divided/ /Bays	A**	B	C	D	E
2 Undiv/No Bays	N/A	3,700	9,700	10,800	11,800
2 Undiv/Bays	N/A	4,700	12,200	13,700	14,700
2 Div/Bays	N/A	4,900	12,900	11,400	15,500
4 Undiv/No Bays	N/A	7,600	19,900	21,800	23,400
4 Undiv/Bays	N/A	9,700	25,200	27,700	29,600
4 Div/Bays	N/A	10,200	28,500	29,200	31,200
6 Div/Bays	N/A	15,400	40,400	43,900	46,800

NON-STATE SIGNALIZED ROADWAYS

(Signalized Intersection Analysis)

Lanes/ Left Turn Bays	A**	B**	C	D	E
2 No Bays	N/A	N/A	1,000	7,200	7,800
2 Bays	N/A	N/A	1,300	8,400	9,900

Source: The Florida Department of Transportation
Systems Planning Office
605 Suwannee Street, Mail Station 19
Tallahassee, FL 32399-0450

http://www.dot.state.fl.us/planning

MULTILANE UNINTERRUPTED HIGHWAYS

55 MPH POSTED SPEED

Lanes/ Divided/Left Bays	A	B	C	D	E
4 Undiv/No Bays	14,300	23,900	31,100	39,000	46,000
4 Undiv/Bays	18,100	30,300	42,000	50,100	58,300
4 Div/Bays	19,000	31,900	44,200	52,800	61,400
6 Div/Bays	28,500	47,900	66,300	79,200	92,100

45 MPH POSTED SPEED

Lanes/ Divided/Left Bays	A	B	C	D	E
4 Undiv/No Bays	12,900	21,600	30,400	36,400	46,000
4 Undiv/Bays	16,300	27,400	38,500	46,100	58,300
4 Div/Bays	17,200	28,800	40,500	48,500	61,400
6 Div/Bays	25,800	43,300	60,800	72,700	92,100

TWO-LANE UNINTERRUPTED HIGHWAYS

55 MPH POSTED SPEED

Lanes/ Left Turn Bays	A	B	C	D	E
2 Undiv/No Bays	4,200	7,400	10,800	14,900	21,200
2 Undiv/ Bays	5,300	9,300	13,300	18,600	26,500
2 Div.Bays	5,600	9,800	13,900	19,500	27,900

45 MPH POSTED SPEED

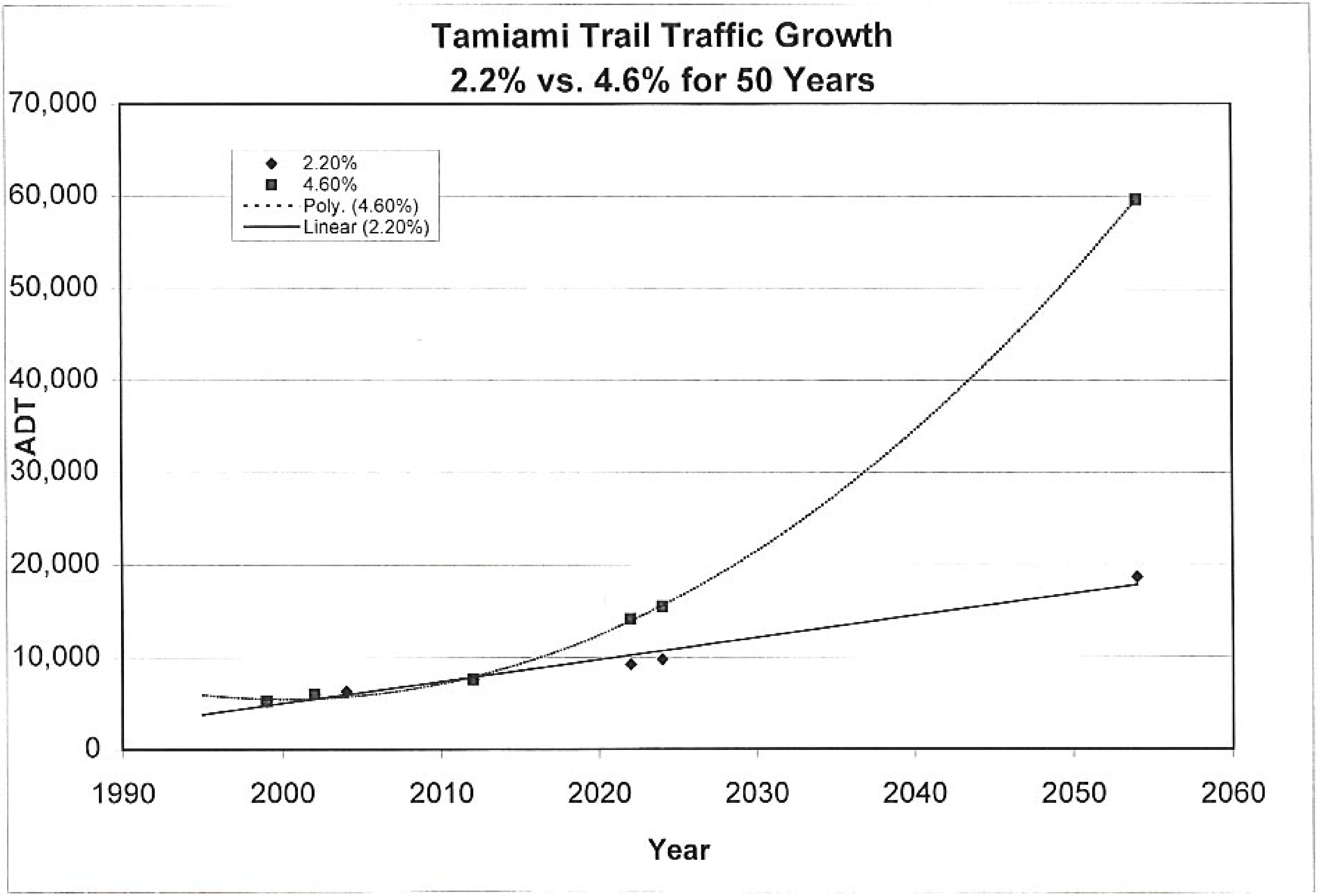
Lanes/ Left Turn Bays	A**	B	C	D	E
2 Undiv/No Bays	N/A	6,200	9,200	13,300	19,900
2 Undiv/ Bays	N/A	7,700	11,400	16,700	24,900
2 Div/Bays	N/A	8,100	12,000	17,500	26,100

* The table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Values shown are annual average daily volumes (based on K100 factors, not peak-to-daily ratios) for levels of service, and are based on the 1997 Update to the Highway Capacity Manual and Florida traffic, roadway, and signalization data. The table's input value assumptions and level of service criteria appear on the following page.

** Cannot be achieved.

*** Volumes are comparable because intersection capacities have been reached.

September 1998



Tamiami Trail Traffic Growth
2.2% vs. 4.6% for 50 Years
2.20%
4.60%
Poly. (4.60%)
Linear (2.20%)
ADT
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1990
2000
2010
2020
2030
2040
2050
2060
Year

Step 2- Subgrade Properties

1. Case 1 Subgrade Mr
2. Case 2 Subgrade Mr

Subgrade Properties

Case 1

For this case, the existing pavement remains in place. It was used for the following options:

- Existing Facility Improved
- Alternative 2 Without Water Quality Treatment

For this option, all designs are assumed to include the following cross section:

5″ AC (Includes 6″ AC with 1″ milling)
12″ LBR 40 Granular Base

FWD Testing was completed to determine both a design M_{ri} value and a design SN_{eff} value. The testing was completed by ERES Consultants (see the report in the Appendix). Also, see the additional data entitled "Modified FWD Data" which is included in this section for more information.

Assumptions from FWD data:

- The average M_{ri} value is 6,177 psi and was rounded down to 6,000 psi.
- The 90th percentile (value such that 90% of the values are greater) M_{ri} value was 4,883 psi, which was rounded up to **5,000** psi.
- The Mean + 2 Standard deviations (Reference Florida DOT Flexible Pavement Design Guide Sec. 6.3.1) M_{ri} value was 15,469 psi which was rounded to **15,000 psi**.
- The 90th percentile backcalculated SN_{eff} was **3.5**.
- The SN_{eff}, taking the mean minus 1 standard deviation was 3.6.

It is noted that from the FWD data and the Boring/Geotechnical information summarized in Plate G1-1, there is no obvious significant influence on the M_{ri} from the peat level, bedrock level or water table level.

SUMMARY: M_{ri} = 5,000 PSI

SN_{eff} = 3.5

Case 2

This option assumes complete muck removal down to the limestone bedrock. It was used for the following options:

- Alternative 2 With Water Quality Treatment and other options requiring new embankment
- Alternative 3 - Both Options
- Alternative 4 - Both Options

Assumptions:

- Muck removal is completed on a 1:2 Control line per Florida DOT Standard Index #500.
- Select fill to replace the muck is A1-A3 material. Assume LBR of A1-A3 material is 12,000 psi.
- 12" LBR-40 Subgrade stabilization was used in the new construction. This results in a structural coefficient of 0.08.

SUMMARY: M_{ri} = 12,000 PSI

Step 3- Determine Other Variables

1. Other Variables
2. Other Notes
3. Design Elevations

Other Variables

Section 5 of the Florida DOT pavement design manual was used to determine the additional design variables. They include the following:

- Standard Deviation **0.45**
- Reliability = **90%** - This is based on the Florida DOT pavement design provided in the example, as well as the fact that it is the high end of the New Rural Arterial Section.

Other Notes:

- Base extensions of the mainline into the shoulder and outside the shoulder are 4 inches, and based on Florida DOT pavement design guide P. 2.1.
- Muck Removal Limits, and the 1:2 (rise:run) are based on Florida DOT Roadway and Traffic Design Standard Index #500 (January 2000).

Elevation Data:

This data represents the statistics derived from the PBS&J topographic survey conducted for this project. The data is from the 500' centerline shots and the approximate 1 mile levee shots. For the centerline data, the first few hundred feet (beginning of job to approx. station 745+00) was eliminated because it was coming down from the higher elevation of 16.0. All measurements are in feet.

	Roadway CL	Top of Levee
Average (ft)	10.95	17.1
Maximum (ft)	11.92	21.0
Minimum (ft)	10.06	15.1

Step 4- Pavement Thickness Calculations

1. Case 1 (Overlay) Calculation
2. Case 2 (New Construction) Calculation
3. Shoulder Pavement Thickness Calculation

Case 1 (Overlay) Thickness Design

The design variables are repeated here:

- 90% Reliability
- The 90th percentile M_{ri} was 5,000 psi (rounded)
- The 90th percentile SN_{eff} = 3.5

50-Year Design Calculations:

- 50-Year Traffic= 11.7 Million ESALS
- SN_{reqd} = 5.75 for M_{ri} = 5,000 psi, Design High Water =7.5 ft.
- SN_{reqd} = 6.17 for M_{ri} = 4,000 psi, Design High Water =9.3 ft.

50-Year Design, 5,000 psi (DHW = 7.5 FT)

Existing:	SN_{eff} From FWD Testing	3.50
New:	6″ AC x 0.44 =	2.64
		6.14 > 5.75 (Req'd) **OK**

This is the design before the water level increase. Note that the FWD measurements are also measuring the effect of the softer peat layer below, which is already saturated.

To account for the increase in water level and resultant softening of the subgrade material, the M_{ri} was dropped to 4,000 psi and the design checked. This is also the lowest value on the Florida DOT design charts. The results of that are presented below for comparison.

50-Year Design, 4,000 psi (DHW = 9.3 FT)

Existing:	SN_{eff} From FWD Testing	3.50
New:	6″ AC x 0.44 =	2.64
		6.14 < 6.17 (Req'd) **OK**

The difference is 0.15 inches AC, which is negligible.

From this analysis, the 6" overlay is sufficient to handle an additional rise in the design high water level. Additionally, a 50-year design is conservative in that there will be an overlay every 7 years, which provides the opportunity to increase the thickness gradually over the years if needed.

For the 7 year overlays, the asphalt that has lost some of its load carrying ability (0.15 structural coefficient) will be removed and new asphalt (0.44 structural coefficient) can be added in a manner to either maintain existing grade or to increase the overall pavement structure.

20-Year Design Calculations:

To check against the Florida DOT recommended design period, a 20-year design was examined. The following variables change for these calculations:

- 20-Year Traffic= 3.3 Million ESALS
- SN_{reqd} = 4.83 for M_{rl} = 5,000 psi, Design High Water =7.5 ft.
- SN_{reqd} = 5.21 for M_{rl} = 4,000 psi, Design High Water =9.3 ft.

<u>20-Year Design, 5,000 psi</u>

Existing:	$SN_{eff\ From}$ FWD Testing	3.50
New:	3″ AC x 0.44 =	<u>1.32</u>
		4.82 = 4.83 (Req'd) **OK**

<u>20-Year Design, 4,000 psi</u>

Existing:	$SN_{eff\ From}$ FWD Testing	3.50
New:	4″ AC x 0.44 =	<u>1.76</u>
		5.26 > 5.21 (Req'd) **OK**

Because the Corps. of Engineers has requested a 50 year analysis, 6″ is used for the concept development.

Design Calculations using Florida DOT Reduced Layer Coefficients and Florida DOT Recommended Mr

To check the SN_{eff} design procedure, an evaluation of the existing pavement using the Florida DOT reduced layer coefficients was used (ref: *Florida DOT Flexible Pavement Design Manual*, Sec. 6.4.4).

- The pavement is in "Poor" condition based on the Florida DOT Condition survey data (Cracking rating 7 or less). This section of Tamiami Trail is rated 6.
- Mean + 2 Standard deviations (Reference Florida DOT Flexible Pavement Design Guide Sec. 6.3.1) M_{ri} value of **15,000 psi** was used.
- To account for the raised water level, the layer coefficient for the granular embankment directly below the asphalt was modeled as a weak LBR 30 subgrade. This is conservative because soaked CBRs of 35 or greater were reported in the geotechnical testing. The LBR is 35/0.8 = 44. The structural coefficient of this material was reduced to 0.06 from 0.08, a 25% reduction. This is similar in magnitude to the 20% reduction of the M_{ri}.
- 50-Year Traffic= 11.7 Million ESALS; SN_{reqd} = 3.97
- 20-Year Traffic= 3.3 Million ESALS; SN_{reqd} = 3.24

<u>50-Year Design, 15,000 psi</u>

Existing:	5" AC x 0.15=	0.75
	12" LBR 30 x 0.06 =	0.72
New:	6" AC x 0.44 =	<u>2.64</u>
		4.11 > 3.97 (Req'd) **OK**

20-Year Design, 15,000 psi

Existing:	5″ AC x 0.15=	0.75
	12″ LBR 30 x 0.06 =	0.72
New:	6″ AC x 0.44 =	2.64
		4.11 > 3.24 (Req'd) **OK**

This shows that the a 4″ overlay is adequate for the requirements, and the 6″ overlay is more than sufficient for the 50 year design using the Florida DOT guidelines.

A check on the areas of overbuild (to get the entire roadway to 11.0 before the overlay begins) was also conducted. It shows that with the overbuild, there is more than sufficient asphalt to support the traffic. The overbuild will consist of up to 12″ of asphalt (minimum elevation 10.06). The extreme case is shown below:

50-Year Design, 15,000 psi WITH OVERBUILD

Overbuild:	12″ x 0.2 =	2.40
Existing:	5″ AC x 0.15=	0.75
	12″ LBR 40 x 0.06 =	0.72
New:	6″ AC x 0.44 =	2.64
		6.51 > 3.97 (Req'd) **OK**

Case 2 (New Construction) Thickness Design

The design variables are repeated here:

- 95% Reliability (increased for new construction)
- M_{ri} of the A1-A3 material is 12,000 psi

50-Year Design Calculations:

- 50-Year Traffic= 11.7 Million ESALS
- SN_{reqd} = 4.56 for M_{ri} = 5,000 psi

50-Year Design, 5,000 psi

New:	¾″ Friction course	0.0
	4″ AC Structural x 0.44 =	1.76
	10″ Limerock Base x 0.18 =	1.80
	(or Optional Base Group 9)	
	12″ LBR 40 Stab. Base x 0.08 =	0.96
		4.52 = 4.56 (Req'd) **OK**

Note that periodic resurfacings can address any issues that develop in the 50 year design period.

Shoulder Thickness Design

The shoulder shall consist of 4" of asphalt surface and 8" limerock base. This exceeds the amount required in Chapter 8 of the Florida DOT design guide, however the construction traffic warrants the thicker surface and base. Since traffic will be shifted onto the shoulders during the construction, as well as future construction and maintenance.

TABLE 5.1

RELATIONSHIP BETWEEN RESILIENT MODULUS (M_R) AND LIMEROCK BEARING RATIO (LBR) SAMPLE VALUES

The following are some Limerock Bearing Ratio (LBR) input values that were input into these equations to obtain Resilient Modulus (M_R) values.

Limerock Bearing	Resilient Modulus	
Ratio (LBR)	PSI	MPa
10	4500	30
12	5000	35
14	5500	39
16	6000	43
18	7000	47
20	7500	51
22	8000	54
24	8500	58
26	9000	61
28	9500	65
30	10000	68
32	10500	72
34	11000	75
36	11500	78
38	12000	81
40	12000	84

TABLE 5.2

RELIABILITY (%R) FOR DIFFERENT ROADWAY FACILITIES

Facility	New	Rehabilitation
Limited Access	80 - 95	95 - 99
Urban Arterials	80 - 90	90 - 97
Rural Arterials	75 - 90	90 - 95 TAMIAMI TRAIL
Collectors	75 - 85	90 - 95

Notes

The type of roadway is determined by the Office Of Planning and can be obtained from the Roadway Characteristics Inventory (RCI).

The designer has some flexibility in selecting values that best fits the project when choosing the Reliability (%R).

Considerations for selecting a reliability level include projected traffic volumes and the consequences involved with early rehabilitation, if actual traffic loadings are greater than anticipated. A detailed discussion of reliability concepts can be found in the AASHTO Guide For Design Of Pavement Structures, .

For traffic volume ranges, refer to Chapter 2, Design Geometrics and Criteria, of the Plans Preparation Manual - Topic No. 625-000-005.

TABLE 5.6

GENERAL USE OPTIONAL BASE GROUPS AND STRUCTURAL NUMBERS (STANDARD INDEX 514) (inches)

BASE THICKNESS AND OPTION CODES											
			Base Options								
Base Group	Structural Range	Base Group Pay Item Number	Limerock LBR 100	Cemented Coquina LBR 100	Shell Rock LBR 100	Bank Run Shell LBR 100	Graded Aggregate Base LBR 100	Type B-12.5	B-12.5 And 4" Granular Subbase, LBR 100 *	RAP Base
			Structural Number (Per. in.)							
			(.18)	(.18)	(.18)	(.18)	(.15)	(.30)	(.30&.15)	(NA)
1	.65-.75	701	4"	4"	4"	4"	4½"	4" △		5" □
2	.80-.90	702	5"	5"	5"	5"	5½"	4" △		
3	.95-1.05	703	5½"	5½"	5½"	5½"	6½"	4" △		
4	1.05-1.15	704	6"	6"	6"	6"	7½"	4" △		
5	1.25-1.35	705	7"	7"	7"	7"	8½"	4½"		
6	1.35-1.50	706	8"	8"	8"	8"	9"	5"		
7	1.50-1.65	707	8½"	8½"	8½"	8½"	10"	5½"		
8	1.65-1.75	708	9½"	9½"	9½"	9½"	11"	5½"		
9	1.75-1.85	709	10"	10"	10"	10"	12"	6"	4"	
10	1.90-2.00	710	11"	11"	11"	11"	13" Ø	6½"	4½"	
11	2.05-2.15	711	12"	12"	12"	12"	14" Ø	7"	5"	
12	2.20-2.30	712	12½"	12½"	12½"	12½"		7½"	5½"	
13	2.35-2.45	713	13½" Ø	13½" Ø	13½" Ø	13½" Ø		8"	6"	
14	2.45-2.55	714	14" Ø	14" Ø	14" Ø	14" Ø		8½"	6½"	
15	2.60-2.70	715						9"	7"	

* ~~For granular subbase, the construction of both the subbase and Type B-12.5 will be~~ paid for under the contract unit price for Optional Base. Granular subbases include Limerock, Cemented Coquina, Shell Rock, Bank Run Shell and Graded Aggregate Base at LBR 100. The base thickness shown is Type B-12.5. All subbase thicknesses are 4".

Ø To be used for widening only, three feet or less.

△ Based on minimum practical thicknesses.

□ Restricted to non-limited access shoulder base construction.

TABLE 6.1

REDUCED STRUCTURAL COEFFICIENTS OF ASPHALT MATERIALS PER UNIT THICKNESS

Recommended Criteria

Good - No Cracking, minor rutting/distortion
Fair - Crack Rated 8 or higher, minor rutting and / or distortion
Poor - Cracking or Rutting rated 7 or less

Pavement Condition should be based on the surface appearance of the pavement (cracking, patching, rutting, etc.) and may be supplemented by additional testing.

	Original	Pavement Condition		
Layer	Design	Good	Fair	Poor
FC-2 or FC-5	0			
FC-1 or FC-4	0.20	0.17	0.15	0.12
FC-3	0.22	0.20	0.17	0.15
FC-6	0.44	0.34	0.25	0.15
Type S or SP	0.44	0.34	0.25	0.15
Type I	0.37	0.30	0.23	0.15
Type II	0.20	0.17	0.15	0.12
Type III	0.30	0.25	0.20	0.15
Binder	0.30	0.25	0.20	0.15
ABC-1	0.20	0.17	0.14	0.10
ABC-2	0.25	0.20	0.16	0.12
ABC-3	0.30	0.25	0.20	0.15
Type B-12.5	0.30	0.25	0.20	0.15
SAHM	0.15	0.13	0.11	0.08
SBRM	0.15	0.13	0.11	0.08

TAMIAMI TRAIL EXISTING ASPHALT

TABLE A.4A

REQUIRED STRUCTURAL NUMBER (SN_R)
90% RELIABILITY (%R)
RESILIENT MODULUS (M_R) RANGE 4000 PSI TO 18000 PSI

RESILIENT MODULUS (M_R), (PSI x 1000)

$ESAL_D$	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
100 000	3.02	2.77	2.59	2.44	2.31	2.21	2.12	2.04	1.97	1.91	1.86	1.81	1.76	1.72	1.68
150 000	3.23	2.97	2.77	2.61	2.47	2.36	2.27	2.19	2.11	2.05	1.99	1.94	1.89	1.84	1.80
200 000	3.39	3.11	2.90	2.73	2.60	2.48	2.38	2.30	2.22	2.15	2.09	2.03	1.98	1.94	1.89
250 000	3.52	3.23	3.01	2.84	2.69	2.57	2.47	2.38	2.30	2.23	2.17	2.11	2.06	2.01	1.97
300 000	3.62	3.33	3.10	2.92	2.78	2.65	2.55	2.46	2.37	2.30	2.24	2.18	2.12	2.07	2.03
350 000	3.71	3.41	3.18	3.00	2.85	2.72	2.61	2.52	2.44	2.36	2.30	2.23	2.18	2.13	2.08
400 000	3.79	3.49	3.25	3.07	2.91	2.78	2.67	2.58	2.49	2.42	2.35	2.29	2.23	2.18	2.13
450 000	3.87	3.56	3.32	3.13	2.97	2.84	2.73	2.63	2.54	2.46	2.39	2.33	2.27	2.22	2.17
500 000	3.93	3.62	3.38	3.18	3.02	2.89	2.77	2.67	2.59	2.51	2.44	2.37	2.31	2.26	2.21
600 000	4.05	3.73	3.48	3.28	3.12	2.98	2.86	2.76	2.67	2.58	2.51	2.45	2.39	2.33	2.28
700 000	4.14	3.82	3.57	3.36	3.20	3.05	2.93	2.83	2.73	2.65	2.58	2.51	2.45	2.39	2.34
800 000	4.23	3.90	3.64	3.44	3.27	3.12	3.00	2.89	2.80	2.71	2.63	2.57	2.50	2.44	2.39
900 000	4.31	3.97	3.71	3.51	3.33	3.18	3.06	2.95	2.85	2.76	2.69	2.62	2.55	2.49	2.44
1 000 000	4.38	4.04	3.78	3.57	3.39	3.24	3.11	3.00	2.90	2.81	2.73	2.66	2.60	2.54	2.48
1 500 000	4.65	4.30	4.03	3.81	3.62	3.46	3.33	3.21	3.10	3.01	2.92	2.85	2.78	2.71	2.65
2 000 000	4.85	4.50	4.21	3.99	3.79	3.63	3.49	3.36	3.25	3.16	3.07	2.99	2.91	2.85	2.78
2 500 000	5.01	4.65	4.36	4.13	3.93	3.76	3.62	3.49	3.38	3.27	3.18	3.10	3.02	2.95	2.89
3 000 000	5.14	4.77	4.48	4.25	4.05	3.88	3.73	3.60	3.48	3.37	3.28	3.19	3.12	3.04	2.98
3 500 000	5.25	4.88	4.59	4.35	4.14	3.97	3.82	3.69	3.57	3.46	3.36	3.28	3.20	3.12	3.06
4 000 000	5.35	4.98	4.68	4.44	4.23	4.06	3.90	3.77	3.65	3.54	3.44	3.35	3.27	3.19	3.12
4 500 000	5.44	5.06	4.76	4.52	4.31	4.13	3.98	3.84	3.72	3.61	3.51	3.42	3.33	3.26	3.19
5 000 000	5.52	5.14	4.83	4.59	4.38	4.20	4.04	3.90	3.78	3.67	3.57	3.47	3.39	3.31	3.24
6 000 000	5.66	5.27	4.96	4.71	4.50	4.32	4.16	4.02	3.89	3.78	3.67	3.58	3.49	3.41	3.34
7 000 000	5.78	5.38	5.07	4.82	4.61	4.42	4.26	4.12	3.99	3.87	3.77	3.67	3.58	3.50	3.43
8 000 000	5.88	5.48	5.17	4.91	4.70	4.51	4.35	4.20	4.07	3.95	3.85	3.75	3.66	3.58	3.50
9 000 000	5.97	5.57	5.26	5.00	4.78	4.59	4.43	4.28	4.15	4.03	3.92	3.82	3.73	3.65	3.57
10 000 000	6.06	5.65	5.33	5.07	4.85	4.66	4.50	4.35	4.22	4.10	3.99	3.89	3.79	3.71	3.63
15 000 000	6.39	5.97	5.64	5.37	5.14	4.95	4.77	4.62	4.48	4.36	4.25	4.14	4.05	3.96	3.88
20 000 000	6.63	6.20	5.86	5.59	5.35	5.15	4.98	4.82	4.68	4.55	4.44	4.33	4.23	4.14	4.06
25 000 000	6.82	6.38	6.04	5.76	5.52	5.32	5.14	4.98	4.84	4.71	4.59	4.48	4.38	4.29	4.20
30 000 000	6.98	6.53	6.18	5.90	5.66	5.45	5.27	5.11	4.96	4.83	4.71	4.60	4.50	4.41	4.32
35 000 000	7.12	6.66	6.31	6.02	5.78	5.57	5.38	5.22	5.07	4.94	4.82	4.71	4.61	4.51	4.42
40 000 000	7.24	6.78	6.42	6.13	5.88	5.67	5.48	5.32	5.17	5.04	4.91	4.80	4.70	4.60	4.51
45 000 000	7.34	6.88	6.52	6.22	5.97	5.76	5.57	5.41	5.26	5.12	5.00	4.88	4.78	4.68	4.59
50 000 000	7.44	6.97	6.61	6.31	6.06	5.84	5.65	5.49	5.34	5.20	5.07	4.96	4.85	4.76	4.66
60 000 000	7.61	7.13	6.76	6.46	6.21	5.99	5.79	5.62	5.47	5.33	5.21	5.09	4.98	4.88	4.79
70 000 000	7.76	7.27	6.90	6.59	6.33	6.11	5.91	5.74	5.59	5.45	5.32	5.20	5.09	4.99	4.90
80 000 000	7.88	7.40	7.01	6.70	6.44	6.22	6.02	5.85	5.69	5.55	5.42	5.30	5.19	5.09	4.99
90 000 000	8.00	7.51	7.12	6.80	6.54	6.31	6.11	5.94	5.78	5.64	5.51	5.39	5.28	5.17	5.08
100 000 000	8.10	7.60	7.21	6.90	6.63	6.40	6.20	6.02	5.86	5.72	5.59	5.47	5.35	5.25	5.15

3.3

11.7

WORST CASE

3.48 ← 3.53
3.57 20

4.22 ← 4.308
4.48 50

49

3.53

TABLE A.7A

3.70
3.75 ← 3.7 m
3.79

REQUIRED STRUCTURAL NUMBER (SN_R)
95% RELIABILITY (%R)
RESILIENT MODULUS (M_R) RANGE 4000 PSI TO 18000 PSI

RESILIENT MODULUS (M_R), (PSI x 1000)

$ESAL_D$	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
100 000	3.22	2.95	2.75	2.59	2.46	2.35	2.26	2.18	2.10	2.04	1.98	1.93	1.88	1.83	1.79
150 000	3.44	3.16	2.94	2.77	2.63	2.52	2.42	2.33	2.25	2.18	2.12	2.06	2.01	1.97	1.92
200 000	3.60	3.31	3.09	2.91	2.76	2.64	2.54	2.44	2.36	2.29	2.23	2.17	2.11	2.06	2.02
250 000	3.74	3.43	3.20	3.02	2.87	2.74	2.63	2.54	2.45	2.38	2.31	2.25	2.19	2.14	2.10
300 000	3.85	3.54	3.30	3.11	2.96	2.83	2.71	2.61	2.53	2.45	2.38	2.32	2.26	2.21	2.16
350 000	3.94	3.63	3.39	3.19	3.03	2.90	2.78	2.68	2.59	2.52	2.44	2.38	2.32	2.27	2.22
400 000	4.03	3.71	3.46	3.26	3.10	2.96	2.85	2.74	2.65	2.57	2.50	2.43	2.37	2.32	2.27
450 000	4.10	3.78	3.53	3.33	3.16	3.02	2.90	2.80	2.70	2.62	2.55	2.48	2.42	2.36	2.31
500 000	4.17	3.84	3.59	3.39	3.22	3.07	2.95	2.85	2.75	2.67	2.59	2.53	2.46	2.41	2.35
600 000	4.29	3.96	3.70	3.49	3.32	3.17	3.04	2.93	2.84	2.75	2.67	2.60	2.54	2.48	2.43
700 000	4.39	4.05	3.79	3.58	3.40	3.25	3.12	3.01	2.91	2.82	2.74	2.67	2.61	2.55	2.49
800 000	4.48	4.14	3.87	3.66	3.48	3.32	3.19	3.08	2.98	2.89	2.80	2.73	2.66	2.60	2.55
900 000	4.56	4.22	3.95	3.73	3.54	3.39	3.25	3.14	3.03	2.94	2.86	2.78	2.72	2.65	2.60
1 000 000	4.63	4.28	4.01	3.79	3.60	3.45	3.31	3.19	3.09	2.99	2.91	2.83	2.76	2.70	2.64
1 500 000	4.91	4.56	4.27	4.04	3.85	3.68	3.54	3.41	3.30	3.20	3.11	3.03	2.96	2.89	2.83
2 000 000	5.12	4.75	4.46	4.23	4.03	3.86	3.71	3.58	3.46	3.36	3.26	3.18	3.10	3.03	2.96
2 500 000	5.28	4.91	4.62	4.37	4.17	4.00	3.84	3.71	3.59	3.48	3.39	3.30	3.22	3.14	3.08
3 000 000	5.42	5.04	4.74	4.50	4.29	4.11	3.96	3.82	$\boxed{3.70}$	3.59	3.49	3.40	3.32	3.24	3.17
3 500 000	5.53	5.15	4.85	4.60	4.39	4.21	4.05	3.92	$\boxed{3.79}$	3.68	3.58	3.49	3.40	3.32	3.25
4 000 000	5.64	5.25	4.94	4.69	4.48	4.30	4.14	4.00	3.87	3.76	3.66	3.56	3.48	3.40	3.32
4 500 000	5.73	5.33	5.03	4.77	4.56	4.38	4.22	4.07	3.95	3.83	3.73	3.63	3.54	3.46	3.39
5 000 000	5.81	5.41	5.10	4.85	4.63	4.45	4.28	4.14	4.01	3.90	3.79	3.69	3.61	3.52	3.45
6 000 000	5.95	5.55	5.24	4.98	4.76	4.57	4.41	4.26	4.13	4.01	3.90	3.80	3.71	3.63	3.55
7 000 000	6.07	5.67	5.35	5.09	4.87	4.68	4.51	4.36	4.23	4.11	4.00	3.90	3.81	3.72	3.64
8 000 000	6.18	5.77	5.45	5.18	4.96	4.77	4.60	4.45	4.32	4.19	4.08	3.98	3.89	3.80	3.72
9 000 000	6.28	5.86	5.54	5.27	5.05	4.85	4.68	4.53	4.39	4.27	4.16	4.06	3.96	3.87	3.79 5-yr
10 000 000	6.36	5.95	5.62	5.35	5.12	4.93	4.75	4.60	$\boxed{4.46}$	4.34	4.23	4.12	4.03	3.94	3.86 ← 3.91
15 000 000	6.70	6.27	5.93	5.65	5.42	5.22	5.04	4.88	$\boxed{4.74}$	4.61	4.50	4.39	4.29	4.20	4.11
20 000 000	6.95	6.51	6.16	5.88	5.64	5.43	5.25	5.09	4.94	4.81	4.69	4.58	4.48	4.39	4.30
25 000 000	7.15	6.70	6.34	6.05	5.81	5.60	5.41	5.25	5.10	4.97	4.85	4.74	4.63	4.54	4.45
30 000 000	7.32	6.86	6.49	6.20	5.95	5.74	5.55	5.39	5.24	5.10	4.98	4.86	4.76	4.66	4.57
35 000 000	7.46	6.99	6.62	6.33	6.07	5.86	5.67	5.50	5.35	5.21	5.09	4.97	4.87	4.77	4.68
40 000 000	7.58	7.11	6.74	6.44	6.18	5.96	5.77	5.60	5.45	5.31	5.19	5.07	4.96	4.86	4.77
45 000 000	7.69	7.21	6.84	6.53	6.28	6.06	5.86	5.69	5.54	5.40	5.27	5.15	5.05	4.95	4.85
50 000 000	7.79	7.31	6.93	6.62	6.36	6.14	5.95	5.77	5.62	5.48	5.35	5.23	5.12	5.02	4.93
60 000 000	7.97	7.48	7.09	6.78	6.52	6.29	6.09	5.92	5.76	5.62	5.49	5.37	5.26	5.15	5.06
70 000 000	8.12	7.62	7.23	6.91	6.65	6.42	6.22	6.04	5.88	5.73	5.60	5.48	5.37	5.27	5.17
80 000 000	8.26	7.75	7.35	7.03	6.76	6.53	6.32	6.14	5.98	5.84	5.70	5.58	5.47	5.36	5.27
90 000 000	8.38	7.86	7.46	7.14	6.86	6.63	6.42	6.24	6.08	5.93	5.80	5.67	5.56	5.45	5.35
100 000 000	8.48	7.96	7.56	7.23	6.95	6.72	6.51	6.33	6.16	6.01	5.88	5.75	5.64	5.53	5.43

4.5
4.46
4.56 = 11.7 m
4.74

Life Cycle Cost Calculations

1. Assumptions
2. Overlay Existing Pavement Costs
3. Overlay New Costs
4. Overbuild Calculations
5. 2006 Overlay Cost Calculation

Life Cycle Cost (LCC) General Assumptions
All Alternatives

- Discount rate is the difference between the market interest rate and the construction inflation rate, and is assumed to be 4% for all calculations.
- Guardrail replacement cost is $11 LF, based on PBS&J cost estimation found in different section of the report. The total replacement cost is (11x2x5280)= $116,000.
- Asphalt concrete price is $38/ton.
- No user costs are considered in the alternatives. These would normally include traffic delay costs, vehicle operating costs, accident costs, and discomfort costs.
- Costs for traffic control are not included.
- No salvage value is assumed.
- Striping/Pavement marking is included in these costs.
- 50-year design/rehabilitation life.

LCC- Overlay Existing
Alternatives: Existing Facility Improved, Alt. 1, Alt. 2 Without Water Quality Treatment

Assumptions for this alternative:

- Assume that guardrail will be replaced in 30 years. Using the replacement cost developed above, the present worth of the guardrail replacement cost is $36,000. This cost was rolled up into other rehabilitation costs and was not considered further, because it is small.
-
- Mainline pavement details:
  12' wide
  Mill ¾" F.C and 2 ½" Structural Course= 3 ¼" Total Milling
  Replace ¾" F.C and 2 ½" Structural Course= 3 ¼" Total Replacement
  Therefore, there will be no elevation change.

- Shoulder pavement details:
  8' wide each side
  Mill 1" Structural Course
  Replace 1" Structural Course
  Therefore, there will be no elevation change.

- Overbuild required to restore cross-slope because of settlement. Assume 25% of roadway area requires overbuild during each resurfacing. Extent of overbuild is from 0" at the centerline to 1 ½" 12' from the centerline. This amounts to an additional 1525 tons of asphalt concrete surface course per overlay cycle.

- See spreadsheets for costs for differing overlay intervals, however an <u>overlay interval of 7 years</u> is assumed based on the life and performance of the overlay from 1993 to the present.

- Square Yard cost per maintenance treatment is $21.25. Total life cycle cost is **$54.32** for a 7 year cycle (6 treatments).

LCC- Overlay New

Alternatives: Alt. 2 With Water Quality Treatment (2, 2C,2D), Alt. 3 With AND Without Water, Quality Treatment, Alt. 4 With AND Without Water Quality Treatment

Assumptions for this alternative:

- Costs of guardrail replacement are rolled into other costs and treated the same as the guardrail was treated for the overlay option.

- Mainline:
  12' wide
  Mill ¾" F.C and 2 ½" Structural Course= 3 ¼" Total Milling
  Replace ¾" F.C and 2 ½" Structural Course= 3 ¼" Total Replacement
  Therefore, there will be no elevation change.

- Shoulder:
  5' wide each side
  Mill 1" Structural Course
  Replace 1" Structural Course

- See spreadsheets for costs for differing overlay intervals, however an overlay interval of 12 years is assumed based on the life and performance new construction (with no muck) around the state is typically about 14 years. To account for any impacts due to being surrounded by swamp, the life is reduced to 12 years.

- Square Yard cost per maintenance treatment is $15.83. Total life cycle cost is **$19.92** for a 12-year cycle (3 treatments).

PBSJ

Tamiami Trail Aternates Study

Job. No: 11032.05
Sheet No.:
Date: **12/18/2000**
Comp. By: **MCJ**
Chk By:

Subject: **LC Cost Calculations: Overlay Existing**

Alternatives: Existing Facility Improved
Alt. 1
Alt. 2 Without Water Quality Treatment

Mill 3 1/4" & Add Level Wedge, 2-1/2" Asphalt + 3/4" Friction Course
Per 1 Mile (2 Lanes)

ESTIMATED PROBABLE CONSTRUCTION COST

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
327- 70- 6	MILLING EXISTING ASPHALT PAVEMENT (3" AVG.)	14,080	SY	$1.10	$15,488.00
331- 72- 10	TYPE S ASPHALTIC CONCRETE (2-1/2")	14,080	SY	$4.25	$59,840.00
	TYPE S ASPHALTIC CONCRETE (Overbuild)	1,525	TON	$38.00	$57,950.00
337- 7- 2	ASPH. CONC. FRICTION COURSE (5/8") (FC-5) (RUBBER) (GRAI	15,254	SY	$1.65	$25,169.10
300- 1- 3	BITUMINOUS MATERIAL (TACK COAT)	1,408	GA	$1.00	$1,408.00
546- 72- 51	RUMBLE STRIP (GROUND-IN) (16" MIN. WIDTH)	2	PM	$1,000.00	$2,000.00
706- 1- 12	REFLECTIVE PAVEMENT MARKERS (CLASS B)	132	EA	$3.60	$475.20
706- 2	REMOVAL OF EXISTING PAVEMENT MARKERS	132	EA	$0.65	$85.80
710- 21	SKIP TRAFFIC STRIPE (W/B)	1	GM	$255.00	$255.00
710- 25- 61	SOLID TRAFFIC STRIPE (W/B) (SOLID) (6")	5,280	LF	$0.20	$1,056.00
710- 26- 61	SOLID TRAFFIC STRIPE (Y) (SOLID) (6")	5,280	LF	$0.20	$1,056.00
711- 31- 9P	TRAFFIC STRIPE SKIP (PPRT) (9" B/W CONTRAST) (10'-30')	1	GM	$6,000.00	$6,000.00
711- 37- 61P	TRAFFIC STRIPE SOLID (PPRT) (6" WHITE)	1	NM	$14,000.00	$14,000.00
711- 38- 61P	TRAFFIC STRIPE SOLID (PPRT) (6" YELLOW)	1	NM	$14,000.00	$14,000.00
Shoulder, 8' wide					
327- 70- 6	MILLING EXISTING ASPHALT PAVEMENT (1" AVG.)	11,147	SY	$0.75	$8,360.00
331- 72- 10	TYPE S ASPHALTIC CONCRETE (1")	11,147	SY	$1.80	$20,064.00

SUB-TOTAL	$227,207.10
EROSION CONTROL (1%)	$2,272.07
SUB-TOTAL	$229,479.17
MAINTENANCE OF TRAFFIC (5%)	$11,473.96
SUB-TOTAL	$240,953.13
MOBILIZATION (8%)	$19,276.25
SUB-TOTAL	$260,229.38
CONTINGENCY (15%)	$39,034.41
TOTAL	$299,263.79

TOTALS: **$149,631.89 Per Lane Mile**
$2.36 Per Sq. Foot
$21.25 Per Sq. Yard

PBSJ

Tamiami Trail Aternates Study

Job. No:	11032.05
Sheet No.:	
Date:	#######
Comp. By:	MCJ
Chk By:	

Subject: **LC Cost Calculations: Overlay Existing**

Alternatives: Existing Facility Improved
Alt. 1
Alt. 2 Without Water Quality Treatment

Note: Figures shown are for SY
Disc. Rate 0.04

10 Year Resurfacing Cycle

Year	Cost	Factor	PW Cost
0		1.00	$0.00
10	$21.25	0.68	$14.36
20	$21.25	0.46	$9.70
30	$21.25	0.31	$6.55
40	$21.25	0.21	$4.43
		Sum	**$35.04**

8 Year Resurfacing Cycle

Year	Cost	Factor	PW Cost
0		1.00	$0.00
8	$21.25	0.73	$15.53
16	$21.25	0.53	$11.35
24	$21.25	0.39	$8.29
32	$21.25	0.29	$6.06
40	$21.25	0.21	$4.43
		Sum	**$45.66**

7 Year Resurfacing Cycle

Year	Cost	Factor	PW Cost
0		1.00	$0.00
7	$21.25	0.76	$16.15
14	$21.25	0.58	$12.27
21	$21.25	0.44	$9.33
28	$21.25	0.33	$7.09
35	$21.25	0.25	$5.39
42	$21.25	0.19	$4.09
		Sum	**$54.32**

6 Year Resurfacing Cycle

Year	Cost	Factor	PW Cost
0		1.00	$0.00
6	$21.25	0.79	$16.80
12	$21.25	0.62	$13.28
18	$21.25	0.49	$10.49
24	$21.25	0.39	$8.29
30	$21.25	0.31	$6.55
36	$21.25	0.24	$5.18
42	$21.25	0.19	$4.09
		Sum	**$64.68**

PBS&J

Tamiami Trail Aternates Study

Job. No: 11032.05
Sheet No.:
Date: **12/18/2000**
Comp. By: **MCJ**
Chk By:

Subject: **LC Cost Calculations: New then OL**

Alternatives: Alt. 2 With Water Quality Treatment
Alt. 2 With Water Quality Treatment
Alt. 3 With AND Without Water Quality Treatment
Alt. 4 With AND Without Water Quality Treatment

Mill 3 1/4" & 2-1/2" Asphalt + 3/4" Friction Course
Per 1 Mile (2 Lanes)

ESTIMATED PROBABLE CONSTRUCTION COST

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL COST
327- 70- 6	MILLING EXISTING ASPHALT PAVEMENT (3" AVG.)	14,080	SY	$1.10	$15,488.00
331- 72- 10	TYPE S ASPHALTIC CONCRETE (2-1/2")	14,080	SY	$4.25	$59,840.00
337- 7- 2	ASPH. CONC. FRICTION COURSE (3/4") (FC-5) (RUBBER) (GRAN.)	15,254	SY	$1.65	$25,169.10
300- 1- 3	BITUMINOUS MATERIAL (TACK COAT)	1,408	GA	$1.00	$1,408.00
546- 72- 51	RUMBLE STRIP (GROUND-IN) (16" MIN. WIDTH)	2	PM	$1,000.00	$2,000.00
706- 1- 12	REFLECTIVE PAVEMENT MARKERS (CLASS B)	132	EA	$3.60	$475.20
706- 2	REMOVAL OF EXISTING PAVEMENT MARKERS	132	EA	$0.65	$85.80
710- 21	SKIP TRAFFIC STRIPE (W/B)	1	GM	$255.00	$255.00
710- 25- 61	SOLID TRAFFIC STRIPE (W/B) (SOLID) (6")	5,280	LF	$0.20	$1,056.00
710- 26- 61	SOLID TRAFFIC STRIPE (Y) (SOLID) (6")	5,280	LF	$0.20	$1,056.00
711- 31- 9P	TRAFFIC STRIPE SKIP (PPRT) (9" B/W CONTRAST) (10'-30')	1	GM	$6,000.00	$6,000.00
711- 37- 61P	TRAFFIC STRIPE SOLID (PPRT) (6" WHITE)	1	NM	$14,000.00	$14,000.00
711- 38- 61P	TRAFFIC STRIPE SOLID (PPRT) (6" YELLOW)	1	NM	$14,000.00	$14,000.00
Shoulder, 5' wide					
327- 70- 6	MILLING EXISTING ASPHALT PAVEMENT (1" AVG.)	11,147	SY	$0.75	$8,360.00
331- 72- 10	TYPE S ASPHALTIC CONCRETE (1")	11,147	SY	$1.80	$20,064.00

SUB-TOTAL	$169,257.10
EROSION CONTROL (1%)	$1,692.57
SUB-TOTAL	$170,949.67
MAINTENANCE OF TRAFFIC (5%)	$8,547.48
SUB-TOTAL	$179,497.15
MOBILIZATION (8%)	$14,359.77
SUB-TOTAL	$193,856.93
CONTINGENCY (15%)	$29,078.54
TOTAL	$222,935.47

TOTALS:	**$111,467.73**	**Per Lane Mile**
	$1.76	**Per Sq. Foot**
	$15.83	**Per Sq. Yard**

PBSJ Tamiami Trail Aternates Study

Job. No:	11032.05
Sheet No.:	
Date:	12/18/2000
Comp. By:	MCJ
Chk By:	

Subject: **LC Cost Calculations: New then OL (Opt. 2N, 3N, 3T, 4N, 4T)**

Alternatives: Alt. 2 With Water Quality Treatment (2, 2C,2D)
Alt. 3 With AND Without Water Quality Treatment
Alt. 4 With AND Without Water Quality Treatment

Note: Figures shown are for SY
Disc. Rate 0.04

12 Year Resurfacing Cycle

Year	Cost	Factor	PW Cost
0		1.00	$0.00
12	$15.83	0.62	$9.89
24	$15.83	0.39	$6.18
36	$15.83	0.24	$3.86
		Sum	**$19.92**

10 Year Resurfacing Cycle

Year	Cost	Factor	PW Cost
0		1.00	$0.00
10	$15.83	0.68	$10.70
20	$15.83	0.46	$7.23
30	$15.83	0.31	$4.88
40	$15.83	0.21	$3.30
		Sum	**$26.10**

8 Year Resurfacing Cycle

Year	Cost	Factor	PW Cost
0		1.00	$0.00
8	$15.83	0.73	$11.57
16	$15.83	0.53	$8.45
24	$15.83	0.39	$6.18
32	$15.83	0.29	$4.51
40	$15.83	0.21	$3.30
		Sum	**$34.01**

6 Year Resurfacing Cycle

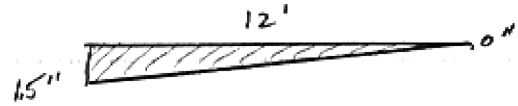
Year	Cost	Factor	PW Cost
0		1.00	$0.00
6	$15.83	0.79	$12.51
12	$15.83	0.62	$9.89
18	$15.83	0.49	$7.82
24	$15.83	0.39	$6.18
30	$15.83	0.31	$4.88
36	$15.83	0.24	$3.86
42	$15.83	0.19	$3.05
		Sum	**$48.18**

PBS&J

COMP. BY: mej
CHK. BY:
DATE: 9/25/00
SHEET NO:
JOB NO:

SUBJECT: LCC - OVERBUILD CALCS

AREA OF OVERBUILD FOR "OVERLAY EXISTING"



× 25% Length

$$\text{Vol} = \left(\frac{1.5''}{12''/\text{ft}} \times \frac{1}{2}\right) \times 12' \times \left(11 \text{ miles} \times 5280 \text{ ft/mile}\right) \times 2 \text{ LANES} \times 25\%$$

$$= 21{,}780 \text{ ft}^3$$

$$\text{Asph. Tonnage} = 21{,}780 \text{ ft}^3 \times 140 \text{ lb/ft}^3 \times \frac{1 \text{ TON}}{2000 \text{ lb}} = \underline{\underline{1524 \text{ TON}}}$$

PBS&J

SUBJECT: 2006 Estimate - TT

COMP. BY: [illegible]
CHK. BY:
DATE: 9/5/00
SHEET NO:
JOB NO:

2006 Estimate

Mainline: Mill 2", add 1.5" Struct., 3/4" F.C = 13.75/SY.
(incl. striping, etc.)

Shldr: Mill 1.0", add 1" Struct.
Mill 1" = 3.00/SY.
(no striping, etc.)

form (00cea) = 13.75/SY =

Area: Stn 1299+46
730+00
56946 = 10.785 Mi

Mainl. = $\frac{56,946 \times 26'}{9\ ft^2/yd^2}$ = 164,510 S.Y. Pavement

Shldr. = $\frac{56,946 \times 18'}{9\ ft^2/yd^2}$ = 113,892 SY. Shoulder

Costs:

Mainl. 164510 x 13.75 = 2.3 million
Shldrs 113892 x 3 = 0.34 mil

2.6 Million

Appendix C-5 – Pavement Core Data

TAMIAMI TRAIL ALTERNATIVES STUDY
PAVEMENT CORES DATA SHEET
LAW PROJECT NO. 40700-0-2369

Core Number	Pavement Courses	Description of Cracks
DCB-5	1/2 inch wearing course	Vertical crack full depth
	2 1/2 inch Structural	Vertical crack full depth
	3 inch Structural	Vertical crack full depth
DCB-20	1/2 inch wearing course	No Cracking
	5 inch Strucutral	No Cracking
CB-25	1/2 inch wearing course	No Cracking
	3 1/8 Structural	No Cracking
DCB-40	1/2 inch wearing course	No Cracking
	10 5/8 inch Structural	No Cracking
CB-60	3/8 inch Wearing Course	No Cracking
	7 1/8 inch Structural	No Cracking
DCB-65	2 inch Structural	No Cracking
CB-80	1/2 Wearing Course	No Cracking
	9 3/8 inch Structural	No Cracking
DCB-85	5/8 inch Wearing Course	No Cracking
	4 inch Structural	No Cracking
DCB-100	3/8 inch Wearing Course	No Cracking
	6 5/8 inch Structural	No Cracking
CB-106	1/2 inch Wearing course	No Cracking
	1 7/8 inch Structural	No Cracking

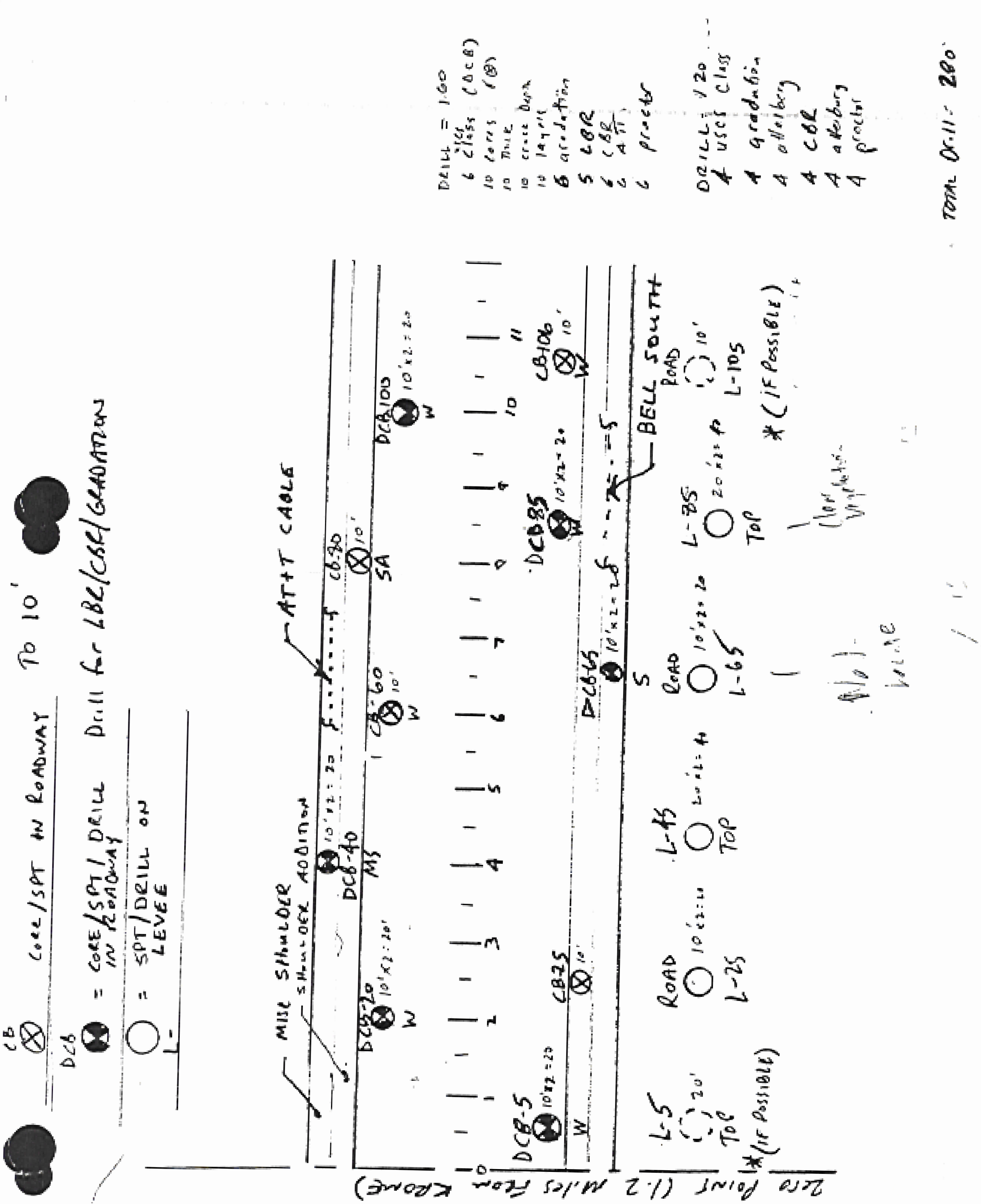
TAMIAMI TRAIL ALTERNATIVES STUDY
PAVEMENT CORES DATA SHEET
LAW PROJECT NO. 40700-0-2369

Core Number	Height(in)	Diameter(in)	Volume(ft^3)	Weight(lb)	Density(lb/ft^3)
DCB-5	5.788	6.672	0.117	16.241	138.81
DCB-20	5.594	5.667	0.082	10.965	133.72
CB-25	3.639	6.718	0.075	9.48	126.39
DCB-40	11.3	5.702	0.167	22.605	135.36
CB-60	7.491	5.714	0.111	14.872	133.98
DCB-65	1.945	6.683	0.039	5.207	133.51
CB-80	9.916	5.723	0.148	19.681	132.98
DCB-85	4.619	6.512	0.089	12.758	143.35
DCB-100	7.019	6.605	0.139	17.895	128.74
CB-106	3.336	6.575	0.066	9.069	137.41

PBS&J

SUBJECT: TAMIAMI TEST LAYOUT - REVISED

COMP. BY: mcj
CHK. BY:
DATE: 7/11/00
SHEET NO:
JOB NO: 011032.05



PBSJ

COMP. BY: mcf
CHK. BY:
DATE: 8/7/00
SHEET NO:
JOB NO:

SUBJECT: Levee Coring Locations - Tamiami Trail

Location	Landmark
T-5 →	10' S. of SR90-112
R-25 →	Right @ SR90-90
T-45 →	288' E of SR90-68
R-65 →	40' W of SR90-47
T-85 →	adjacent to DCB-85
R-105 →	across from DCB 106

T = Top (top of levee)
R = Road (canal level)

APP D

APPENDIX D STRUCTURES ANALYSIS

Appendix D-1 Unit Prices and Cost Summary

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBS&J Done by: M. LeComte
UNIT PRICES	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST	November 29, 2000

Unit prices assumed for cost analysis:

	UNIT	UNIT PRICE
SUPERSTRUCTURE ITEMS:		
Concrete	CY	$310
Reinforcing Steel	lbs	$0.45
Bridge Floor Grooving	SY	$2.50
Traffic Railing Barrier	Ft	$35
Expansion Joints	Ft	$84
Neoprene Bearing Pads	CF	$425
AASHTO Beams		
Type II	Ft	$54
Type III	Ft	$67
Type IV	Ft	$84
Type V	Ft	$92
Type VI	Ft	$110
FBT72	Ft	$97
FBT78	Ft	$110
Florida Double Tees		
FDT18	Ft	$180
FDT24	Ft	$215
FDT30	Ft	$250
Precast Slab Units	CY	$750
SUBSTRUCTURE ITEMS:		
Concrete	CY	$415
Reinforcing Steel	lbs	$0.45
Prestressed Piles (18" square)		
Piling, Driven & Furnished	Ft	$33
Test Pile	Ft	$160
Pile Splice	Each	$110
Pile Hole Preformed	Each	$200
Prestressed Piles (24" square)		
Piling, Driven & Furnished	Ft	$46
Test Pile	Ft	$160
Pile Splice	Each	$170
Pile Hole Preformed	Each	$200
Drilled Shaft (36" diameter)		
Drilled Shaft	Ft	$220
Test Load	Each	$50,000
Temporary Casing	Ft	
Core (Shaft Excavation)	Ft	
Casing, Steel (Splice included in shaft price)	Each	
Excavation, Unclasified Shaft	Ft	
Drilled Shaft Sidewall Over Reaming	Ft	
Excavation, Unclasified Extra depth	Ft	
Steel Sheet Pile	SF	$16
Mobilization (5% of Construction Cost)		5%
Contingency (15% of Construction Cost)		15%

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

STRUCTURAL COST COMPARISON OF ALTERNATIVES

I:\STRUCT\Design\Tamiami-Trail\design\cost analysis\[Detailed Summary .xls]RESULT

RESULTS OF COST COMPARISON STUDY:

Description:	Alternatives 1,2 & 4 (Bridges 1 & 4)	Alternatives 1,2 & 4 (Bridges 2 & 3)	Alternative 5
Bridge Type:	Type A	Type B	Type H
Total bridge length:	475.00 Ft.	345.50 Ft.	59220.00 Ft.
Bridge Width:	43.08 Ft.	43.08 Ft.	43.08 Ft.
Optimum Span Arrangement:	11 spans at 43.18 FT.	8 spans at 43.19 FT.	555 spans at 106.70 FT.
Most economical superstructure type:	Type II	Type II	Type V
Most economical substructure type:	18 Piles	18 Piles	DRILLED SHAFT
Total Construction Cost	**$632,347**	**$470,880**	**$80,516,220**
Deck Square Footage	20,465 sf	14,885 sf	2,551,375 sf
Cost Per Square Foot	**$30.90/sf**	**$31.63/sf**	**$31.56/sf**

Description:	Alternative 3 (Bridges 1 & 8)	Alternative 3 (Bridges 2 & 7)	Alternative 3 (Bridge 3)	Alternative 3 (Bridge 4)	Alternative 3 (Bridges 5 & 6)
Bridge Type:	Type C	Type D	Type E	Type F	Type G
Total bridge length:	1214.00 Ft.	248.50 Ft.	194.00 Ft.	168.50 Ft.	1200.00 Ft.
Bridge Width:	43.08 Ft.	43.08 Ft.	43.08 Ft.	35.08 Ft.	43.08 Ft.
Optimum Span Arrangement:	12 spans at 101.17 FT.	6 spans at 41.42 FT.	3 spans at 64.67 FT.	4 spans at 42.13 FT.	13 spans at 92.31 FT.
Most economical superstructure type:	Type V	Type II	Type III	Type II	Type V
Most economical substructure type:	DRILLED SHAFT	18 Piles	18 Piles	18 Piles	24 IN. PILES
Total Construction Cost	**$1,868,922**	**$358,412**	**$293,571**	**$234,453**	**$1,642,172**
Deck Square Footage	52,303 sf	10,706 sf	8,358 sf	5,912 sf	51,700 sf
Cost Per Square Foot	**$35.73/sf**	**$33.48/sf**	**$35.12/sf**	**$39.66/sf**	**$31.76/sf**

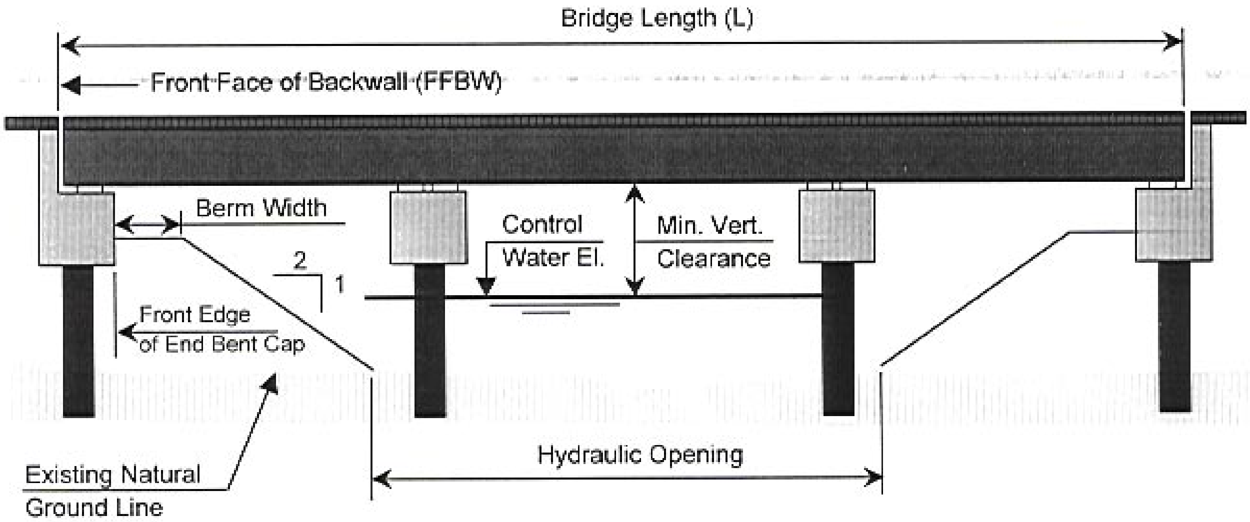
Description:	Alternative 2C	Alternative 2D	Alternative 1 & 2 (North Detour)
Additional Construction Cost	**$39,341,403**	**$57,707,396**	**$52,577,456**

Alternatives	Total Construction Cost of Structures
Alternative 1	$2,206,454
Alternative 2	$2,206,454
Alternative 2C	$41,547,856
Alternative 2D	$59,913,849
Alternative 1 (North Detour)	$52,577,456
Alternative 2 (North Detour)	$52,577,456
Alternative 3	$8,267,036
Alternative 4	$2,206,454
Alternative 5	$80,516,220

Appendix D-2 Alternatives 1 and 2

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 1 & 4)	**BRIDGE AND SPAN LENGTHS**	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST		November 29, 2000

Determine Bridge Length based on hydraulic opening:



Hydraulic Opening Width at Natural Ground Level	425.00 Ft.
Natural Ground Elevation	5.00 Ft.
Control Water Elevation	7.50 Ft.
Minimum Clearance over Control Water Elevation	6.00 Ft.
Berm Width	3.00 Ft.
Vertical Distance from bottom of beams to top of Berm where slope starts	2.25 Ft.
Distance From FFBW to Front Edge of End Bent Cap	2.00 Ft.
Minimum Span length	28.00 Ft.
Preliminary Bridge Length (No adjustment due to pile/drilled shaft in the opening), L' =	**460.00 Ft.**

Number of Spans	ADJUSTED BRIDGE LENGTH (L)			ADJUSTED SPAN LENGTH		
	18 in. Pile	24 in. Pile	36 in. Drilled Shaft	18 in. Pile	24 in. Pile	36 in. Drilled Shaft
5	466.00 Ft.	468.00 Ft.	472.00 Ft.	93.20 Ft.	93.60 Ft.	94.40 Ft.
6	467.50 Ft.	470.00 Ft.	475.00 Ft.	77.92 Ft.	78.33 Ft.	79.17 Ft.
7	469.00 Ft.	472.00 Ft.	478.00 Ft.	67.00 Ft.	67.43 Ft.	68.29 Ft.
8	470.50 Ft.	474.00 Ft.	481.00 Ft.	58.81 Ft.	59.25 Ft.	60.13 Ft.
9	472.00 Ft.	476.00 Ft.	484.00 Ft.	52.44 Ft.	52.89 Ft.	53.78 Ft.
10	473.50 Ft.	478.00 Ft.	487.00 Ft.	47.35 Ft.	47.80 Ft.	48.70 Ft.
11	475.00 Ft.	480.00 Ft.	490.00 Ft.	43.18 Ft.	43.64 Ft.	44.55 Ft.
12	476.50 Ft.	482.00 Ft.	493.00 Ft.	39.71 Ft.	40.17 Ft.	41.08 Ft.
13	478.00 Ft.	484.00 Ft.	496.00 Ft.	36.77 Ft.	37.23 Ft.	38.15 Ft.
14	479.50 Ft.	486.00 Ft.	499.00 Ft.	34.25 Ft.	34.71 Ft.	35.64 Ft.
15	481.00 Ft.	488.00 Ft.	502.00 Ft.	32.07 Ft.	32.53 Ft.	33.47 Ft.
16	482.50 Ft.	490.00 Ft.	505.00 Ft.	30.16 Ft.	30.63 Ft.	31.56 Ft.
17	484.00 Ft.	492.00 Ft.	508.00 Ft.	28.47 Ft.	28.94 Ft.	29.88 Ft.
18	485.50 Ft.	494.00 Ft.	511.00 Ft.			28.39 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 1 & 4)	**BEAM SPACING vs. DESIGN SPAN**	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST		November 29, 2000

Determine beam spacing and design span:

Bridge Width: 43.08 Ft.
Slab Thickness: 8.50 in.

Number of Beams	[1]Beam Spacing	[2]Design Span					
		AASHTO Type II	AASHTO Type III	AASHTO Type IV	18" Double T	24" Double T	30" Double T
4	10.77 Ft.	**46.00 Ft.**	**65.00 Ft.**	**84.00 Ft.**			
5	8.62 Ft.	**52.00 Ft.**	**73.00 Ft.**	**90.00 Ft.**			
6	7.18 Ft.	**58.00 Ft.**	**78.00 Ft.**	**96.00 Ft.**	**40.00 Ft.**	**50.00 Ft.**	**60.00 Ft.**
7	6.15 Ft.	**62.00 Ft.**	**82.00 Ft.**	**98.00 Ft.**			
8	5.39 Ft.	**66.00 Ft.**	**84.00 Ft.**	**102.00 Ft.**			

[1]Beam spacing is based on assuming the cantilever to be half of the beam spacing.

[2]Design spans are determined from the charts based on the beam spacing given.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: M. LeConte
Checked by: C. Li
November 29, 2000

Alternatives 1, 2 & 4 (Bridges 1 & 4)

AASHTO BEAMS COMPARISON

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST

Number of Spans	Adjusted Span Length			Number of AASHTO Beams Required								
	PILES		Drilled Shaft	18" Piles			24" Piles			Drilled Shaft		
	18 in.	24 in.		II	III	IV	II	III	IV	II	III	IV
5	93.20 Ft.	93.60 Ft.	94.40 Ft.			6			6			6
6	77.92 Ft.	78.33 Ft.	79.17 Ft.		6	4		7	4		7	4
7	67.00 Ft.	67.43 Ft.	68.29 Ft.	8	5	4	8	5	4		5	4
8	58.81 Ft.	59.25 Ft.	60.13 Ft.	7	4	4	7	4	4	7	4	4
9	52.44 Ft.	52.89 Ft.	53.78 Ft.	6	4	4	6	4	4	6	4	4
10	47.35 Ft.	47.80 Ft.	48.70 Ft.	5	4	4	5	4	4	5	4	4
11	43.18 Ft.	43.64 Ft.	44.55 Ft.	4	4	4	4	4	4	4	4	4
12	39.71 Ft.	40.17 Ft.	41.08 Ft.	4	4	4	4	4	4	4	4	4
13	36.77 Ft.	37.23 Ft.	38.15 Ft.	4	4	4	4	4	4	4	4	4
14	34.25 Ft.	34.71 Ft.	35.64 Ft.	4	4	4	4	4	4	4	4	4
15	32.07 Ft.	32.53 Ft.	33.47 Ft.	4	4	4	4	4	4	4	4	4
16	30.16 Ft.	30.63 Ft.	31.56 Ft.	4	4	4	4	4	4	4	4	4
17	28.47 Ft.	28.94 Ft.	29.88 Ft.	4	4	4	4	4	4	4	4	4
18			28.39 Ft.							4	4	4

Number of Spans	Estimated Construction Cost of AASHTO Beams								
	18 in. Piles			24 in. Piles			DRILLED SHAFT		
	II	III	IV	II	III	IV	II	III	IV
5	N/A	N/A	$234,864	N/A	N/A	$235,872	N/A	N/A	$237,888
6	N/A	$187,935	$157,080	N/A	$220,430	$157,920	N/A	$222,775	$159,600
7	$202,608	$157,115	$157,584	$203,904	$158,120	$158,592	N/A	$160,130	$160,608
8	$177,849	$126,094	$158,088	$179,172	$127,032	$159,264	$181,818	$128,908	$161,616
9	$152,928	$126,496	$158,592	$154,224	$127,568	$159,936	$156,816	$129,712	$162,624
10	$127,845	$126,898	$159,096	$129,060	$128,104	$160,608	$131,490	$130,516	$163,632
11	$102,600	$127,300	$159,600	$103,680	$128,640	$161,280	$105,840	$131,320	$164,640
12	$102,924	$127,702	$160,104	$104,112	$129,176	$161,952	$106,488	$132,124	$165,648
13	$103,248	$128,104	$160,608	$104,544	$129,712	$162,624	$107,136	$132,928	$166,656
14	$103,572	$128,506	$161,112	$104,976	$130,248	$163,296	$107,784	$133,732	$167,664
15	$103,896	$128,908	$161,616	$105,408	$130,784	$163,968	$108,432	$134,536	$168,672
16	$104,220	$129,310	$162,120	$105,840	$131,320	$164,640	$109,080	$135,340	$169,680
17	$104,544	$129,712	$162,624	$106,272	$131,856	$165,312	$109,728	$136,144	$170,688
18	N/A	N/A	N/A	N/A	N/A	N/A	$110,376	$136,948	$171,696

Number of Spans	Most Economical AASHTO Beam Type					
	18" PILES		24" PILES		DRILLED SHAFT	
	TYPE	COST	TYPE	COST	TYPE	COST
5	IV	$234,864	IV	$235,872	IV	$237,888
6	IV	$157,080	IV	$157,920	IV	$159,600
7	III	$157,115	III	$158,120	III	$160,130
8	III	$126,094	III	$127,032	III	$128,908
9	III	$126,496	III	$127,568	III	$129,712
10	III	$126,898	III	$128,104	III	$130,516
11	II	$102,600	II	$103,680	II	$105,840
12	II	$102,924	II	$104,112	II	$106,488
13	II	$103,248	II	$104,544	II	$107,136
14	II	$103,572	II	$104,976	II	$107,784
15	II	$103,896	II	$105,408	II	$108,432
16	II	$104,220	II	$105,840	II	$109,080
17	II	$104,544	II	$106,272	II	$109,728
18					II	$110,376

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: M. LeConte

Alternatives 1, 2 & 4 (Bridges 1 & 4)

SUPERSTRUCTURE ALTERNATIVES COMPARISON

Checked by: C. Li

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST

November 29, 2000

Number of Spans	AASHTO BEAMS WITH DECK						Florida Double Tee Beams					
	18" PILES		24" PILES		DRILLED SHAF		18" PILES		24" PILES		DRILLED SHAF	
	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST
5	IV	$446,732	IV	$448,649	IV	$452,484	N/A		N/A		N/A	
6	IV	$369,630	IV	$371,607	IV	$375,560	N/A		N/A		N/A	
7	III	$370,347	III	$372,716	III	$377,454	N/A		N/A		N/A	
8	III	$340,008	III	$342,537	III	$347,596	FDT30	$705,750	FDT30	$711,000	N/A	
9	III	$341,092	III	$343,982	III	$349,764	FDT30	$708,000	FDT30	$714,000	FDT30	$726,000
10	III	$342,176	III	$345,428	III	$351,932	FDT24	$610,815	FDT24	$616,620	FDT24	$628,230
11	II	$318,560	II	$321,913	II	$328,620	FDT24	$612,750	FDT24	$619,200	FDT24	$632,100
12	II	$319,566	II	$323,254	II	$330,632	FDT18	$514,620	FDT24	$621,780	FDT24	$635,970
13	II	$320,572	II	$324,596	II	$332,643	FDT18	$516,240	FDT18	$522,720	FDT18	$535,680
14	II	$321,578	II	$325,937	II	$334,655	FDT18	$517,860	FDT18	$524,880	FDT18	$538,920
15	II	$322,584	II	$327,278	II	$336,667	FDT18	$519,480	FDT18	$527,040	FDT18	$542,160
16	II	$323,590	II	$328,620	II	$338,679	FDT18	$521,100	FDT18	$529,200	FDT18	$545,400
17	II	$324,596	II	$329,961	II	$340,691	FDT18	$522,720	FDT18	$531,360	FDT18	$548,640
18					II	$342,703					FDT18	$551,880

Deck Reinforcement 205 lbs/CY concrete
Cost of Deck per foot $455/ft.

Number of Spans	PRECAST SLAB						MOST ECONOMICAL SUPERSTRUCTURE ALTERNATIVE								
	18" PILES		24" PILES		DRILLED SHAF		18 in. Pile			24 in. Pile			36 in. Shaft		
	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost
5							6	IV	$446,732	6	IV	$448,649	6	IV	$452,484
6							4	IV	$369,630	4	IV	$371,607	4	IV	$375,560
7							5	III	$370,347	5	III	$372,716	5	III	$377,454
8							4	III	$340,008	4	III	$342,537	4	III	$347,596
9							4	III	$341,092	4	III	$343,982	4	III	$349,764
10							4	III	$342,176	4	III	$345,428	4	III	$351,932
11							4	II	$318,560	4	II	$321,913	4	II	$328,620
12	23	$1,092,990					4	II	$319,566	4	II	$323,254	4	II	$330,632
13	22	$1,048,760	22	$1,061,924	23	$1,137,719	4	II	$320,572	4	II	$324,596	4	II	$332,643
14	21	$1,004,231	21	$1,017,844	21	$1,045,070	4	II	$321,578	4	II	$325,937	4	II	$334,655
15	20	$959,402	20	$973,364	20	$1,001,289	4	II	$322,584	4	II	$327,278	4	II	$336,667
16	19	$914,274	19	$928,486	19	$956,909	4	II	$323,590	4	II	$328,620	4	II	$338,679
17	18	$868,847	18	$883,208	19	$962,593	4	II	$324,596	4	II	$329,961	4	II	$340,691
18					18	$917,316							4	II	$342,703

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: M. LeComte
Checked by: C. Li
November 29, 2000

Alternatives 1, 2 & 4 (Bridges 1 & 4)

FOUNDATION LOADS and NUMBER of 18 in. PRESTRESSED PILES

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST

Bridge Width 43.08 Ft. Number of lanes 3 Number of Florida Double Tee = 6

Number of Spans	5 spans	6 spans	7 spans	8 spans	9 spans	10 spans	11 spans	12 spans	13 spans	14 spans	15 spans	16 spans	17 spans
Beam Type	IV	IV	III	III	III	III	II	II	II	II	II	II	II
Beam Weight (k/ft)	0.822 klf	0.822 klf	0.583 klf	0.583 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	6 beams	4 beams	5 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	93.20 Ft.	77.92 Ft.	67.00 Ft.	58.81 Ft.	52.44 Ft.	47.35 Ft.	43.18 Ft.	39.71 Ft.	36.77 Ft.	34.25 Ft.	32.07 Ft.	30.16 Ft.	28.47 Ft.
Beam Span (ft)	91.20 Ft.	75.92 Ft.	65.00 Ft.	56.81 Ft.	50.44 Ft.	45.35 Ft.	41.18 Ft.	37.71 Ft.	34.77 Ft.	32.25 Ft.	30.07 Ft.	28.16 Ft.	26.47 Ft.
Bridge Deck Thickness (in)	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load													
Beam Load (End Bent)	547.3 k	393.5 k	325.9 k	268.9 k	239.8 k	216.5 k	180.3 k	165.8 k	153.5 k	143.0 k	133.9 k	125.9 k	115.0 k
Beam Load (Pier)	1094.7 k	787.1 k	651.8 k	537.9 k	479.6 k	433.0 k	360.6 k	331.5 k	307.0 k	286.0 k	267.7 k	251.8 k	230.1 k
Live Load													
Reduction factor	0.9												
Impact factor for Substructure	1.0												
LL Reaction per lane (END BENT)													
Truck load	64.8 k	63.4 k	62.0 k	60.6 k	59.2 k	57.8 k	56.4 k	55.1 k	53.7 k	52.4 k	51.0 k	49.7 k	48.4 k
Lane load	55.8 k	50.9 k	47.4 k	44.8 k	42.8 k	41.2 k	39.8 k	38.7 k	37.8 k	37.0 k	36.3 k	35.7 k	35.1 k
Total Live Load (END BENT)	174.9 k	171.1 k	167.3 k	163.5 k	159.8 k	156.1 k	152.4 k	148.7 k	145.1 k	141.4 k	137.8 k	134.2 k	130.7 k
LL Reaction per lane (PIER)													
Truck load	66.0 k	64.8 k	63.6 k	62.5 k	61.3 k	60.2 k	59.0 k	57.9 k	56.8 k	55.6 k	54.5 k	53.4 k	52.3 k
Lane load	85.6 k	75.9 k	68.9 k	63.6 k	59.6 k	56.3 k	53.6 k	51.4 k	49.5 k	47.9 k	46.5 k	45.3 k	44.2 k
Total Live Load (PIER)	231.2 k	204.8 k	186.0 k	171.8 k	165.6 k	162.5 k	159.4 k	156.3 k	153.3 k	150.3 k	147.2 k	141.3 k	141.3 k
Total Load													
Superstructure Load (END BENT)	898.4 k	740.8 k	669.3 k	608.6 k	575.7 k	548.7 k	508.8 k	490.6 k	474.7 k	460.5 k	447.8 k	436.2 k	421.8 k
Superstructure Load (PIER)	1384.1 k	1050.1 k	896.0 k	767.9 k	703.4 k	653.7 k	578.1 k	546.0 k	518.5 k	494.4 k	473.2 k	454.2 k	429.5 k
Foundation													
Maximum pile spacing	13.0 Ft.												
Service Load Capacity of Piles	**147.0 k**												
Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.												
Number of Piles Required For END BENT	7	6	5	5	4	4	4	4	4	4	4	4	4
Number of Piles Required For PIER	10	8	7	6	5	5	4	4	4	4	4	4	4
Service Design Load (END BENT)	128 k	123 k	134 k	122 k	144 k	137 k	127 k	123 k	119 k	115 k	112 k	109 k	105 k
Service Design Load (PIER)	138 k	131 k	128 k	128 k	141 k	131 k	145 k	137 k	130 k	124 k	118 k	114 k	107 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

Alternatives 1, 2 & 4 (Bridges 1 & 4)

FOUNDATION LOADS and NUMBER of 24 in. PRESTRESSED PILES

PBSJ

Done by: M. LeConte
Checked by: C. Li
November 29, 2000

L:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST

Bridge Width 43.08 Ft. Number of lanes 3 Number of Florida Double Tee = 6

		5 spans	6 spans	7 spans	8 spans	9 spans	10 spans	11 spans	12 spans	13 spans	14 spans	15 spans	16 spans	17 spans
	Number of Spans	5 spans	6 spans	7 spans	8 spans	9 spans	10 spans	11 spans	12 spans	13 spans	14 spans	15 spans	16 spans	17 spans
	Beam Type	IV	IV	III	III	III	III	II	II	II	II	II	II	II
	Beam Weight (k/ft)	0.822 klf	0.822 klf	0.583 klf	0.583 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf
	Number of Beams	6 beams	4 beams	5 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams
	Span Length (ft)	93.60 Ft.	78.33 Ft.	67.43 Ft.	59.25 Ft.	52.89 Ft.	47.80 Ft.	43.64 Ft.	40.17 Ft.	37.23 Ft.	34.71 Ft.	32.53 Ft.	30.63 Ft.	28.94 Ft.
	Beam Span (ft)	91.60 Ft.	76.33 Ft.	65.43 Ft.	57.25 Ft.	50.89 Ft.	45.80 Ft.	41.64 Ft.	38.17 Ft.	35.23 Ft.	32.71 Ft.	30.53 Ft.	28.63 Ft.	26.94 Ft.
	Bridge Deck Thickness (in)	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.00 in.
	Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
	Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load														
	Beam Load (End Bent)	549.7 k	395.6 k	328.0 k	270.9 k	241.9 k	218.6 k	182.2 k	167.7 k	155.4 k	144.9 k	135.8 k	127.9 k	116.9 k
	Beam Load (Pier)	1099.4 k	791.3 k	656.0 k	541.9 k	483.7 k	437.2 k	364.3 k	335.4 k	310.9 k	289.9 k	271.6 k	255.7 k	233.9 k
Live Load														
	Reduction factor	0.9												
	Impact factor for Substructure	1.0												
LL Reaction per lane (END BENT)														
	Truck load	64.8 k	63.4 k	62.0 k	60.7 k	59.3 k	57.9 k	56.6 k	55.3 k	54.0 k	52.6 k	51.3 k	50.1 k	48.8 k
	Lane load	56.0 k	51.1 k	47.6 k	45.0 k	42.9 k	41.3 k	40.0 k	38.9 k	37.9 k	37.1 k	36.4 k	35.8 k	35.3 k
Total Live Load (END BENT)		175.0 k	171.2 k	167.5 k	163.8 k	160.1 k	156.4 k	152.8 k	149.2 k	145.7 k	142.1 k	138.6 k	135.2 k	131.7 k
LL Reaction per lane (PIER)														
	Truck load	66.0 k	64.9 k	63.7 k	62.5 k	61.4 k	60.3 k	59.2 k	58.1 k	57.0 k	55.9 k	54.8 k	53.7 k	52.7 k
	Lane load	85.9 k	76.1 k	69.2 k	63.9 k	59.8 k	56.6 k	53.9 k	51.7 k	49.8 k	48.2 k	46.8 k	45.6 k	44.5 k
Total Live Load (PIER)		231.9 k	205.6 k	186.7 k	172.6 k	165.8 k	162.8 k	159.8 k	156.8 k	153.8 k	150.8 k	147.9 k	145.0 k	142.2 k
Total Load														
	Superstructure Load (END BENT)	900.8 k	743.0 k	671.6 k	610.8 k	578.0 k	551.1 k	511.1 k	493.0 k	477.2 k	463.2 k	450.6 k	439.1 k	424.7 k
	Superstructure Load (PIER)	1389.5 k	1055.0 k	900.9 k	772.6 k	707.7 k	658.1 k	582.3 k	550.3 k	522.8 k	498.9 k	477.7 k	458.9 k	434.2 k
Foundation														
	Maximum pile spacing	13.0 Ft.												
	Service Load Capacity of Piles	**260.0 k**												
	Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.												
	Number of Piles Required For END BENT	4	4	4	4	4	4	4	4	4	4	4	4	4
	Number of Piles Required For PIER	6	5	4	4	4	4	4	4	4	4	4	4	4
	Service Design Load (END BENT)	225 k	186 k	168 k	153 k	145 k	138 k	128 k	123 k	119 k	116 k	113 k	110 k	106 k
	Service Design Load (PIER)	232 k	211 k	225 k	193 k	177 k	165 k	146 k	138 k	131 k	125 k	119 k	115 k	109 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

Alternatives 1, 2 & 4 (Bridges 1 & 4)

FOUNDATION LOADS on DRILLED SHAFT

PBSJ

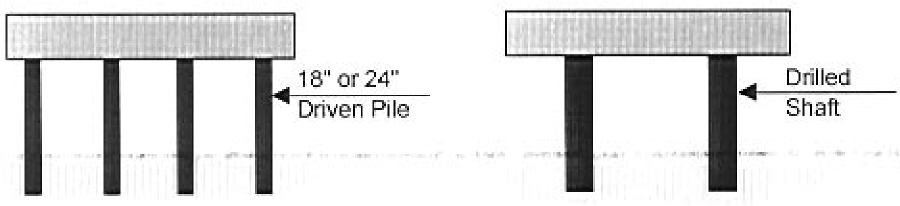
Done by: M. LeComte
Checked by: C. Li
November 29, 2000

I:\STRUCT\Design\Tamiami Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST

Bridge Width 43.08 Ft. Number of lanes 3 Number of Florida Double Tee = 6

Number of Spans	5 spans	6 spans	7 spans	8 spans	9 spans	10 spans	11 spans	12 spans	13 spans	14 spans	15 spans	16 spans	17 spans	18 spans
Beam Type	IV	IV	III	III	III	III	II	II	II	II	II	II	II	II
Beam Weight (k/ft)	0.822 klf	0.822 klf	0.583 klf	0.583 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	6 beams	4 beams	5 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	94.40 Ft.	79.17 Ft.	68.29 Ft.	60.13 Ft.	53.78 Ft.	48.70 Ft.	44.55 Ft.	41.08 Ft.	38.15 Ft.	35.64 Ft.	33.47 Ft.	31.56 Ft.	29.88 Ft.	28.39 Ft.
Beam Span (ft)	92.40 Ft.	77.17 Ft.	66.29 Ft.	58.13 Ft.	51.78 Ft.	46.70 Ft.	42.55 Ft.	39.08 Ft.	36.15 Ft.	33.64 Ft.	31.47 Ft.	29.56 Ft.	27.88 Ft.	26.39 Ft.
Bridge Deck Thickness (in)	8.50 in.	8.50 in.	8.50 in	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in	8.50 in.	8.50 in.	8.50 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load														
Beam Load (End Bent)	554.4 k	399.9 k	332.2 k	274.9 k	245.9 k	222.7 k	186.0 k	171.5 k	159.3 k	148.8 k	139.7 k	131.8 k	120.7 k	114.7 k
Beam Load (Pier)	1108.8 k	799.7 k	664.3 k	549.9 k	491.8 k	445.4 k	371.9 k	343.0 k	318.6 k	297.6 k	279.4 k	263.5 k	241.5 k	229.4 k
Live Load														
Reduction factor	0.9													
Impact factor for Substructure	1.0													
LL Reaction per lane (END BENT)														
Truck load	64.9 k	63.5 k	62.2 k	60.8 k	59.5 k	58.2 k	56.9 k	55.6 k	54.4 k	53.1 k	51.9 k	50.7 k	49.5 k	48.3 k
Lane load	56.2 k	51.3 k	47.9 k	45.2 k	43.2 k	41.6 k	40.3 k	39.1 k	38.2 k	37.4 k	36.7 k	36.1 k	35.6 k	35.1 k
Total Live Load (END BENT)	175.2 k	171.5 k	167.8 k	164.2 k	160.7 k	157.1 k	153.7 k	150.2 k	146.8 k	143.5 k	140.2 k	136.9 k	133.7 k	130.5 k
LL Reaction per lane (PIER)														
Truck load	66.1 k	64.9 k	63.8 k	62.7 k	61.6 k	60.5 k	59.4 k	58.4 k	57.3 k	56.3 k	55.3 k	54.3 k	53.3 k	52.3 k
Lane load	86.4 k	76.7 k	69.7 k	64.5 k	60.4 k	57.2 k	54.5 k	52.3 k	50.4 k	48.8 k	47.4 k	46.2 k	45.1 k	44.2 k
Total Live Load (PIER)	233.3 k	207.0 k	188.2 k	174.1 k	166.3 k	163.4 k	160.5 k	157.6 k	154.8 k	152.0 k	149.2 k	146.5 k	143.8 k	141.1 k
Total Load														
Superstructure Load (END BENT)	934.8 k	776.5 k	705.2 k	644.3 k	611.8 k	585.0 k	544.8 k	526.9 k	511.3 k	497.5 k	485.1 k	473.9 k	459.6 k	450.4 k
Superstructure Load (PIER)	1419.7 k	1084.3 k	930.1 k	801.5 k	735.7 k	686.3 k	609.9 k	578.2 k	550.9 k	527.1 k	506.2 k	487.6 k	462.8 k	448.1 k
Foundation														
Maximum pile spacing	16.0 Ft.													
Location of Ext. shaft from coping at End Bent	6.0 Ft.													
Number of Piles Required For END BENT	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Number of Piles Required For PIER	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Service Design Load (END BENT)	312 k	259 k	235 k	215 k	204 k	195 k	182 k	176 k	170 k	166 k	162 k	158 k	153 k	150 k
Service Design Load (PIER)	710 k	542 k	465 k	401 k	368 k	343 k	305 k	289 k	275 k	264 k	253 k	244 k	231 k	224 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBSJ Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 1 & 4) — **INTERMEDIATE BENTS / PIERS**	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST	November 29, 2000



Intermediate Bent Section

Pier Section
(2 Drilled Shafts)

Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
Pile Length Above Ground	8 ft.	8 ft.	8 ft.
Total Length of Pile	27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area	9.0 sq.ft	9.0 sq.ft	12.0 sq.ft
Bent Cap Length	43 ft.	43 ft.	43 ft.
Total Concrete Volume	14.4 CY	14.4 CY	19.1 CY
Reinforcement at 145 lbs/CY	2082 lbs	2082 lbs	2776 lbs
Estimated Cost of Bent Cap	**$6,897**	**$6,897**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	**DRILLED SHAFT**	36 in.
Number of test loads per bridge	3 ea.	3 ea.	Number of test loads per bridge	1 ea.
			Core (Shaft Excavation)	
			Length of temporary casing	
Est. total cost of test piles w/ dynamic load test per bridge	$20,160	$20,160	% of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% of pile hole preformed	100%	100%	Excavation, unclassified extra depth	

Number of Spans	Number of Piles Required 18 in.	Number of Piles Required 24 in.	Number of Drilled Shafts 36 in.	Total Cost of Piles per Bent / Pier 18" Pile	Total Cost of Piles per Bent / Pier 24" Pile	Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier 18" Pile	Total Estimated Cost of ONE Pier 24" Pile	Total Estimated Cost of ONE Pier 36" Shaft
5	10	6	2	$16,060	$13,794	$22,180	$22,957	$20,691	$31,376
6	8	5	2	$12,848	$11,327	$19,680	$19,745	$18,224	$28,876
7	7	4	2	$11,074	$9,196	$18,013	$17,971	$16,093	$27,209
8	6	4	2	$9,492	$8,716	$16,823	$16,389	$15,613	$26,019
9	5	4	2	$8,030	$8,356	$15,930	$14,927	$15,253	$25,126
10	5	4	2	$7,750	$8,076	$15,236	$14,647	$14,973	$24,431
11	4	4	2	$6,424	$7,852	$14,680	$13,321	$14,749	$23,876
12	4	4	2	$6,241	$7,669	$14,225	$13,138	$14,566	$23,421
13	4	4	2	$6,088	$7,516	$13,847	$12,985	$14,413	$23,043
14	4	4	2	$5,959	$7,387	$13,526	$12,856	$14,284	$22,722
15	4	4	2	$5,848	$7,276	$13,251	$12,745	$14,173	$22,447
16	4	4	2	$5,752	$7,180	$13,013	$12,649	$14,077	$22,209
17	4	4	2	$5,668	$7,096	$12,805	$12,565	$13,993	$22,001
18			2			$12,621			$21,817

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 1 & 4)	END BENTS	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST		November 29, 2000

	Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
	Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
	Pile Length Above Ground	8 ft.	8 ft.	8 ft.
	Total Length of Pile	27 ft.	27 ft.	22 ft.
	Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
	Bent cap cross sectional area	7.5 sq.ft	7.5 sq.ft	12.0 sq.ft
	Bent Cap Length	43 ft.	43 ft.	43 ft.
	Total Concrete Volume	12.0 CY	12.0 CY	19.1 CY
Reinforcement at	145 lbs/CY	1735 lbs	1735 lbs	2776 lbs
	Estimated Cost of Bent Cap	**$5,747**	**$5,747**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	DRILLED SHAFTS	36 in.
			Core(Shaft Excavation)	
			Length of temporary casing	
			Percentage of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% Pile hole preformed	100%	100%	xcavation, unclassified extra depth	

Number of Spans	Number of Piles Required[1] 18 in.	24 in.	Number of Drilled Shafts[2] 36 in.	Total Cost of Piles per Bent / Pier 18" Pile	24" Pile	Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier 18" Pile	24" Pile	36" Shaft
5	9	6	5	$9,918	$8,754	$24,200	$29,053	$27,889	$46,783
6	8	6	5	$8,816	$8,754	$24,200	$27,951	$27,889	$46,783
7	7	6	5	$7,714	$8,754	$24,200	$24,181	$25,221	$44,115
8	7	6	5	$7,714	$8,754	$24,200	$24,181	$25,221	$44,115
9	6	6	5	$6,612	$8,754	$24,200	$23,079	$25,221	$44,115
10	6	6	5	$6,612	$8,754	$24,200	$23,079	$25,221	$44,115
11	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
12	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
13	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
14	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
15	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
16	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
17	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
18			5			$24,200			$41,688

[1]Includes wingwall piles for Type IV, III, II beams.

[2]Includes wingwall drilled shafts for Type IV, III, II beams.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

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Done by: M. LeComte

Alternatives 1, 2 & 4 (Bridges 1 & 4)

SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISON

Checked by: C. Li

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternatives-1,2,4\[Type A Bridges 1 and 4.xls]COST

November 29, 2000

Number	ADJUSTED SPAN LENGTH			Number	Cost of Substructure			Cost of Superstructure			Total Cost of Structure		
of Spans	18 in. Pile	24 in. Pile	36 in. Shaft	of Piers	18 in. Pile	24 in. Pile	36 in. Shaft	18 in. Pile	24 in. Pile	36 in. Shaft	18 in. Pile	24 in. Pile	36 in. Shaft
5	93.20 Ft.	93.60 Ft.	94.40 Ft.	4	$149,934	$138,542	$219,070	$446,732	$448,649	$452,484	$596,666	$587,191	$671,554
6	77.92 Ft.	78.33 Ft.	79.17 Ft.	5	$154,627	$146,898	$237,946	$369,630	$371,607	$375,560	$524,256	$518,504	$613,506
7	67.00 Ft.	67.43 Ft.	68.29 Ft.	6	$156,187	$146,999	$251,486	$370,347	$372,716	$377,454	$526,534	$519,715	$628,939
8	58.81 Ft.	59.25 Ft.	60.13 Ft.	7	$163,084	$159,732	$270,362	$340,008	$342,537	$347,596	$503,092	$502,269	$617,957
9	52.44 Ft.	52.89 Ft.	53.78 Ft.	8	$165,573	$172,465	$289,237	$341,092	$343,982	$349,764	$506,665	$516,447	$639,001
10	47.35 Ft.	47.80 Ft.	48.70 Ft.	9	$177,980	$185,198	$308,113	$342,176	$345,428	$351,932	$520,155	$530,625	$660,045
11	43.18 Ft.	43.64 Ft.	44.55 Ft.	10	$174,513	$193,077	$322,135	$318,560	$321,913	$328,620	$493,072	$514,990	$650,755
12	39.71 Ft.	40.17 Ft.	41.08 Ft.	11	$185,817	$205,809	$341,011	$319,566	$323,254	$330,632	$505,383	$529,064	$671,643
13	36.77 Ft.	37.23 Ft.	38.15 Ft.	12	$197,122	$218,542	$359,887	$320,572	$324,596	$332,643	$517,694	$543,138	$692,530
14	34.25 Ft.	34.71 Ft.	35.64 Ft.	13	$208,427	$231,275	$378,763	$321,578	$325,937	$334,655	$530,005	$557,212	$713,418
15	32.07 Ft.	32.53 Ft.	33.47 Ft.	14	$219,732	$244,008	$397,639	$322,584	$327,278	$336,667	$542,316	$571,287	$734,306
16	30.16 Ft.	30.63 Ft.	31.56 Ft.	15	$231,037	$256,741	$416,515	$323,590	$328,620	$338,679	$554,627	$585,361	$755,194
17	28.47 Ft.	28.94 Ft.	29.88 Ft.	16	$242,342	$269,474	$435,391	$324,596	$329,961	$340,691	$566,938	$599,435	$776,082
18			28.39 Ft.	17			$454,267			$342,703			$796,970

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

Number of Spans	Estimated Cost	Foundation Alternative	Superstructure Alternative	Number of Spans	Number of Beams	Number of Piles or Drilled Shafts	Total Length of Piles or Drilled Shafts	Number of Test Piles	Total Length of Test Piles
5	$587,191	24 in.	Type IV	5	6	33	891 ft	3	126 ft
6	$518,504	24 in.	Type IV	6	4	34	918 ft	3	126 ft
7	$519,715	24 in.	Type III	7	5	33	891 ft	3	126 ft
8	$502,269	24 in.	Type III	8	4	37	999 ft	3	126 ft
9	$506,665	18 in.	Type III	9	4	49	1323 ft	3	126 ft
10	$520,155	18 in.	Type III	10	4	54	1458 ft	3	126 ft
11	$493,072	18 in.	Type II	11	4	49	1323 ft	3	126 ft
12	$505,383	18 in.	Type II	12	4	53	1431 ft	3	126 ft
13	$517,694	18 in.	Type II	13	4	57	1539 ft	3	126 ft
14	$530,005	18 in.	Type II	14	4	61	1647 ft	3	126 ft
15	$542,316	18 in.	Type II	15	4	65	1755 ft	3	126 ft
16	$554,627	18 in.	Type II	16	4	69	1863 ft	3	126 ft
17	$566,938	18 in.	Type II	17	4	73	1971 ft	3	126 ft
18	$796,970	36 in.	Type II	18	4	44	968 ft		

$493,072 <--- Minimum

RESULT OF COST COMPARISON STUDY:

Most economical superstructure type: Type II
Most economical substructure type: 18 in.
Optimum Span Arrangement: 11 spans at 43.18 FT.
Total bridge length: 475.00 Ft.
Total number of beams: 44
Total length of beams: 1900.00 Ft.
Number of piles or drilled Shafts: 49
Length of Piles or drilled Shafts: 1323.00 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeConte
Alternatives 1, 2 & 4 (Bridges 1 & 4)	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
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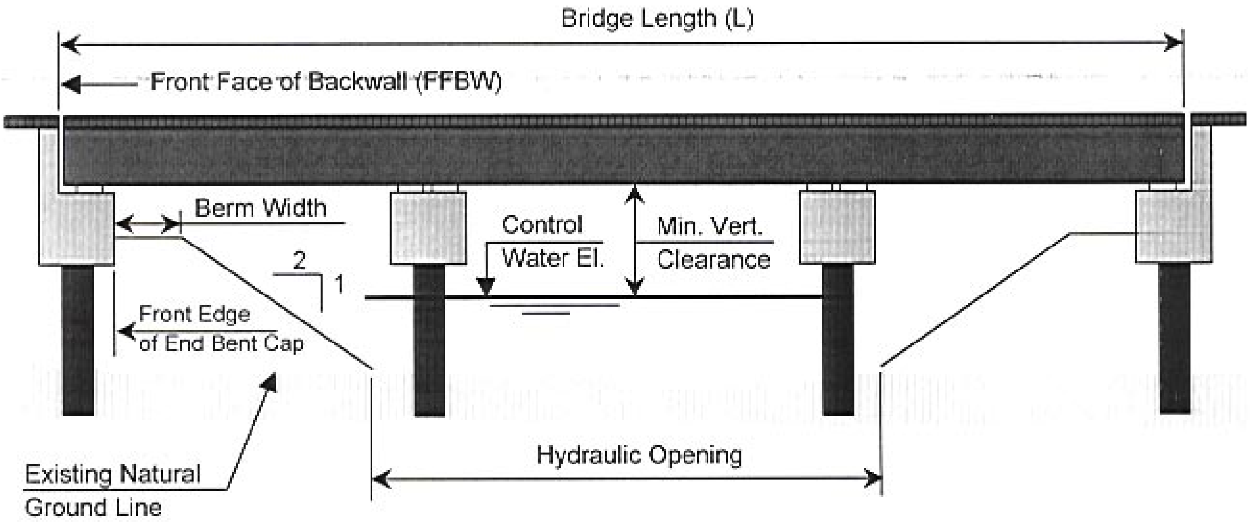
Item	Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:				
Concrete	505.6	CY	$310	$156,721
Reinforcing Steel[1]	103638	LBS	$0.45	$46,637
Bridge Floor Grooving	2111	SY	$2.50	$5,278
Traffic Railing Barrier	950.0	FT	$35	$33,250
Expansion Joints[3]	86.2	FT	$84	$7,238
Type II Beam	1900.0	FT	$54	$102,600
Neoprene Bearing Pads	9.627	CY	$425	$4,092
		Superstructure Subtotal		$355,815
SUBSTRUCTURE:				
Concrete	201.9	CY	$415	$83,796
Reinforcing Steel[2]	29278	LBS	$0.45	$13,175
Pile Hole, Preformed	49	EA	$200	$9,800
Test Piles	126	Ft.	$160	$20,160
18 in. Prestressed Concrete Piles (F & I)	1323	Ft.	$33	$43,659
Pile Splices	5	EA	$110	$550
Drilled shaft		LF	$220	
Test load for drilled shaft		EA	$50,000	
Core (Shaft Excavation)		LF		
Temporary casing		LF		
Casing splice		EA		
Excavation, unclassified shaft		LF		
Drilled shaft sidewall overreaming		LF		
Excavation, unclassified extra depth		LF		
		Substructure Subtotal		$171,140
		Construction Cost Subtotal		**$526,955**
Mobilization (5% of Construction Cost)	1	LS		$ 26,348
Contingency (15% of Construction Cost)	1	LS		$ 79,043
		Total Construction Cost		**$632,347**
		Deck Square Footage (Ft.)		20,465
		Cost Per Square Foot		**$30.90/sf**

[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

[3]Number of expansion piers: 2

Determine Bridge Length based on hydraulic opening:



Hydraulic Opening Width at Natural Ground Level	300.00 Ft.
Natural Ground Elevation	5.00 Ft.
Control Water Elevation	7.50 Ft.
Minimum Clearance over Control Water Elevation	6.00 Ft.
Berm Width	3.00 Ft.
Vertical Distance from bottom of beams to top of Berm where slope starts	2.25 Ft.
Distance From FFBW to Front Edge of End Bent Cap	2.00 Ft.
Minimum Span length	28.00 Ft.
Preliminary Bridge Length (No adjustment due to pile/drilled shaft in the opening), L' =	**335.00 Ft.**

Number of Spans	ADJUSTED BRIDGE LENGTH (L)			ADJUSTED SPAN LENGTH		
	18 in. Pile	24 in. Pile	36 in. Drilled Shaft	18 in. Pile	24 in. Pile	36 in. Drilled Shaft
4	339.50 Ft.	341.00 Ft.	344.00 Ft.	84.88 Ft.	85.25 Ft.	86.00 Ft.
5	341.00 Ft.	343.00 Ft.	347.00 Ft.	68.20 Ft.	68.60 Ft.	69.40 Ft.
6	342.50 Ft.	345.00 Ft.	350.00 Ft.	57.08 Ft.	57.50 Ft.	58.33 Ft.
7	344.00 Ft.	347.00 Ft.	353.00 Ft.	49.14 Ft.	49.57 Ft.	50.43 Ft.
8	345.50 Ft.	349.00 Ft.	356.00 Ft.	43.19 Ft.	43.63 Ft.	44.50 Ft.
9	347.00 Ft.	351.00 Ft.	359.00 Ft.	38.56 Ft.	39.00 Ft.	39.89 Ft.
10	348.50 Ft.	353.00 Ft.	362.00 Ft.	34.85 Ft.	35.30 Ft.	36.20 Ft.
11	350.00 Ft.	355.00 Ft.	365.00 Ft.	31.82 Ft.	32.27 Ft.	33.18 Ft.
12	351.50 Ft.	357.00 Ft.	368.00 Ft.	29.29 Ft.	29.75 Ft.	30.67 Ft.
13	353.00 Ft.	359.00 Ft.	371.00 Ft.			28.54 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 2 & 3)	**BEAM SPACING vs. DESIGN SPAN**	Checked by: C. Li
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Determine beam spacing and design span:

Bridge Width: 43.08 Ft.
Slab Thickness: 8.50 in.

Number of Beams	**[1]Beam Spacing**	**[2]Design Span**					
		AASHTO Type II	AASHTO Type III	AASHTO Type IV	18" Double T	24" Double T	30" Double T
4	10.77 Ft.	**46.00 Ft.**	**65.00 Ft.**	**84.00 Ft.**			
5	8.62 Ft.	**52.00 Ft.**	**73.00 Ft.**	**90.00 Ft.**			
6	7.18 Ft.	**58.00 Ft.**	**78.00 Ft.**	**96.00 Ft.**	**40.00 Ft.**	**50.00 Ft.**	**60.00 Ft.**
7	6.15 Ft.	**62.00 Ft.**	**82.00 Ft.**	**98.00 Ft.**			
8	5.39 Ft.	**66.00 Ft.**	**84.00 Ft.**	**102.00 Ft.**			

[1]Beam spacing is based on assuming the cantilever to be half of the beam spacing.

[2]Design spans are determined from the charts based on the beam spacing given.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 2 & 3)	AASHTO BEAMS COMPARISON	Checked by: C. Li
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Number of Spans	Adjusted Span Length			Number of AASHTO Beams Required								
	PILES		Drilled	18" Piles			24" Piles			Drilled Shaft		
	18 in.	24 in.	Shaft	II	III	IV	II	III	IV	II	III	IV
4	84.88 Ft.	85.25 Ft.	86.00 Ft.		8	5		8	5		8	5
5	68.20 Ft.	68.60 Ft.	69.40 Ft.		5	4		5	4		5	4
6	57.08 Ft.	57.50 Ft.	58.33 Ft.	6	4	4	6	4	4	7	4	4
7	49.14 Ft.	49.57 Ft.	50.43 Ft.	5	4	4	5	4	4	5	4	4
8	43.19 Ft.	43.63 Ft.	44.50 Ft.	4	4	4	4	4	4	4	4	4
9	38.56 Ft.	39.00 Ft.	39.89 Ft.	4	4	4	4	4	4	4	4	4
10	34.85 Ft.	35.30 Ft.	36.20 Ft.	4	4	4	4	4	4	4	4	4
11	31.82 Ft.	32.27 Ft.	33.18 Ft.	4	4	4	4	4	4	4	4	4
12	29.29 Ft.	29.75 Ft.	30.67 Ft.	4	4	4	4	4	4	4	4	4
13			28.54 Ft.							4	4	4

Number of Spans	Estimated Construction Cost of AASHTO Beams								
	18 in. Piles			24 in. Piles			DRILLED SHAFT		
	II	III	IV	II	III	IV	II	III	IV
4	N/A	$181,972	$142,590	N/A	$182,776	$143,220	N/A	$184,384	$144,480
5	N/A	$114,235	$114,576	N/A	$114,905	$115,248	N/A	$116,245	$116,592
6	$110,970	$91,790	$115,080	$111,780	$92,460	$115,920	$132,300	$93,800	$117,600
7	$92,880	$92,192	$115,584	$93,690	$92,996	$116,592	$95,310	$94,604	$118,608
8	$74,628	$92,594	$116,088	$75,384	$93,532	$117,264	$76,896	$95,408	$119,616
9	$74,952	$92,996	$116,592	$75,816	$94,068	$117,936	$77,544	$96,212	$120,624
10	$75,276	$93,398	$117,096	$76,248	$94,604	$118,608	$78,192	$97,016	$121,632
11	$75,600	$93,800	$117,600	$76,680	$95,140	$119,280	$78,840	$97,820	$122,640
12	$75,924	$94,202	$118,104	$77,112	$95,676	$119,952	$79,488	$98,624	$123,648
13	N/A	N/A	N/A	N/A	N/A	N/A	$80,136	$99,428	$124,656

Number of Spans	Most Economical AASHTO Beam Type					
	18" PILES		24" PILES		DRILLED SHAFT	
	TYPE	COST	TYPE	COST	TYPE	COST
4	IV	$142,590	IV	$143,220	IV	$144,480
5	III	$114,235	III	$114,905	III	$116,245
6	III	$91,790	III	$92,460	III	$93,800
7	III	$92,192	III	$92,996	III	$94,604
8	II	$74,628	II	$75,384	II	$76,896
9	II	$74,952	II	$75,816	II	$77,544
10	II	$75,276	II	$76,248	II	$78,192
11	II	$75,600	II	$76,680	II	$78,840
12	II	$75,924	II	$77,112	II	$79,488
13					II	$80,136

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 2 & 3)	**SUPERSTRUCTURE ALTERNATIVES COMPARISON**	Checked by: C. Li
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Number	AASHTO BEAMS WITH DECK						Florida Double Tee Beams					
of	18" PILES		24" PILES		DRILLED SHAF		18" PILES		24" PILES		DRILLED SHAF	
Spans	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST
4	IV	$296,944	IV	$298,256	IV	$300,880	N/A		N/A		N/A	
5	III	$269,271	III	$270,851	III	$274,009	N/A		N/A		N/A	
6	III	$247,508	III	$249,315	III	$252,928	FDT30	$513,750	FDT30	$517,500	FDT30	$525,000
7	III	$248,592	III	$250,760	III	$255,096	FDT24	$443,760	FDT24	$447,630	FDT30	$529,500
8	II	$231,710	II	$234,058	II	$238,752	FDT24	$445,695	FDT24	$450,210	FDT24	$459,240
9	II	$232,716	II	$235,399	II	$240,764	FDT18	$374,760	FDT18	$379,080	FDT18	$387,720
10	II	$233,722	II	$236,740	II	$242,776	FDT18	$376,380	FDT18	$381,240	FDT18	$390,960
11	II	$234,728	II	$238,082	II	$244,788	FDT18	$378,000	FDT18	$383,400	FDT18	$394,200
12	II	$235,734	II	$239,423	II	$246,800	FDT18	$379,620	FDT18	$385,560	FDT18	$397,440
13					II	$248,812					FDT18	$400,680

Deck Reinforcement 205 lbs/CY concrete
Cost of Deck per foot $455/ft.

Number	PRECAST SLAB						MOST ECONOMICAL SUPERSTRUCTURE ALTERNATIVE								
of	18" PILES		24" PILES		DRILLED SHAF		18 in. Pile			24 in. Pile			36 in. Shaft		
Spans	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost
4							5	IV	$296,944	5	IV	$298,256	5	IV	$300,880
5							5	III	$269,271	5	III	$270,851	5	III	$274,009
6							4	III	$247,508	4	III	$249,315	4	III	$252,928
7							4	III	$248,592	4	III	$250,760	4	III	$255,096
8							4	II	$231,710	4	II	$234,058	4	II	$238,752
9	23	$795,945	23	$805,120	23	$823,470	4	II	$232,716	4	II	$235,399	4	II	$240,764
10	21	$729,874	21	$739,298	22	$794,249	4	II	$233,722	4	II	$236,740	4	II	$242,776
11	20	$698,110	20	$708,083	20	$728,029	4	II	$234,728	4	II	$238,082	4	II	$244,788
12	18	$630,991	19	$676,468	19	$697,312	4	II	$235,734	4	II	$239,423	4	II	$246,800
13					18	$665,997							4	II	$248,812

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
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Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: M. LeComte
Checked by: C. Li
November 29, 2000

Alternatives 1, 2 & 4 (Bridges 2 & 3)

FOUNDATION LOADS and NUMBER of 18 in. PRESTRESSED PILES

F:\STRUCT\Design\Tamiami-Trail\design\cost analysis\alternatives-1,2,4\[Type B Bridges 2 and 3.xls]SUPER COMP

Bridge Width 43.08 Ft. | Number of lanes 3 | Number of Florida Double Tee = 6

Number of Spans	**4 spans**	5 spans	6 spans	7 spans	8 spans	9 spans	10 spans	11 spans	12 spans
Beam Type	IV	III	III	III	II	II	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	5 beams	5 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	84.88 Ft.	68.20 Ft.	57.08 Ft.	49.14 Ft.	43.19 Ft.	38.56 Ft.	34.85 Ft.	31.82 Ft.	29.29 Ft.
Beam Span (ft)	82.88 Ft.	66.20 Ft.	55.08 Ft.	47.14 Ft.	41.19 Ft.	36.56 Ft.	32.85 Ft.	29.82 Ft.	27.29 Ft.
Bridge Deck Thickness (in)	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load									
Beam Load (End Bent)	463.6 k	331.7 k	261.0 k	224.7 k	180.3 k	161.0 k	145.5 k	132.8 k	122.3 k
Beam Load (Pier)	927.1 k	663.5 k	522.1 k	449.4 k	360.6 k	321.9 k	291.0 k	265.7 k	244.6 k
Live Load									
Reduction factor	0.9								
Impact factor for Substructure	1.0								
LL Reaction per lane (END BENT)									
Truck load	64.1 k	62.1 k	60.2 k	58.3 k	56.4 k	54.6 k	52.7 k	50.9 k	49.1 k
Lane load	53.2 k	47.8 k	44.3 k	41.7 k	39.8 k	38.3 k	37.2 k	36.2 k	35.4 k
Total Live Load (END BENT)	173.0 k	167.8 k	162.6 k	157.5 k	152.4 k	147.3 k	142.3 k	137.4 k	132.5 k
LL Reaction per lane (PIER)									
Truck load	65.4 k	63.8 k	62.2 k	60.6 k	59.0 k	57.5 k	55.9 k	54.4 k	52.9 k
Lane load	80.3 k	69.6 k	62.5 k	57.5 k	53.6 k	50.7 k	48.3 k	46.4 k	44.7 k
Total Live Load (PIER)	216.9 k	188.0 k	168.8 k	163.6 k	159.4 k	155.2 k	151.0 k	146.9 k	142.8 k
Total Load									
Superstructure Load (END BENT)	812.7 k	675.6 k	599.7 k	558.3 k	508.8 k	484.4 k	463.9 k	446.3 k	430.8 k
Superstructure Load (PIER)	1202.2 k	909.7 k	749.1 k	671.2 k	578.2 k	535.3 k	500.2 k	470.7 k	445.5 k
Foundation									
Maximum pile spacing	13.0 Ft.								
Service Load Capacity of Piles	**147.0 k**								
Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.								
Number of Piles Required For END BENT	6	5	5	4	4	4	4	4	4
Number of Piles Required For PIER	9	7	6	5	4	4	4	4	4
Service Design Load (END BENT)	135 k	135 k	120 k	140 k	127 k	121 k	116 k	112 k	108 k
Service Design Load (PIER)	134 k	130 k	125 k	134 k	145 k	134 k	125 k	118 k	111 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

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Checked by: C. Li
November 29, 2000

Alternatives 1, 2 & 4 (Bridges 2 & 3)

FOUNDATION LOADS and NUMBER of 24 in. PRESTRESSED PILES

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Bridge Width 43.08 Ft. | Number of lanes 3 | Number of Florida Double Tee = 6

Number of Spans	4 spans	5 spans	6 spans	7 spans	8 spans	9 spans	10 spans	11 spans	12 spans
Beam Type	IV	III	III	III	II	II	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	5 beams	5 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	85.25 Ft.	68.60 Ft.	57.50 Ft.	49.57 Ft.	43.63 Ft.	39.00 Ft.	35.30 Ft.	32.27 Ft.	29.75 Ft.
Beam Span (ft)	83.25 Ft.	66.60 Ft.	55.50 Ft.	47.57 Ft.	41.63 Ft.	37.00 Ft.	33.30 Ft.	30.27 Ft.	27.75 Ft.
Bridge Deck Thickness (in)	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load									
Beam Load (End Bent)	465.6 k	333.7 k	262.9 k	226.7 k	182.1 k	162.8 k	147.4 k	134.7 k	124.2 k
Beam Load (Pier)	931.2 k	667.4 k	525.9 k	453.4 k	364.3 k	325.6 k	294.7 k	269.5 k	248.4 k
Live Load									
Reduction factor	0.9								
Impact factor for Substructure	1.0								
LL Reaction per lane (END BENT)									
Truck load	64.1 k	62.2 k	60.3 k	58.4 k	56.6 k	54.8 k	53.0 k	51.2 k	49.4 k
Lane load	53.3 k	48.0 k	44.4 k	41.9 k	40.0 k	38.5 k	37.3 k	36.3 k	35.5 k
Total Live Load (END BENT)	173.1 k	168.0 k	162.8 k	157.8 k	152.8 k	147.9 k	143.0 k	138.2 k	133.4 k
LL Reaction per lane (PIER)									
Truck load	65.4 k	63.8 k	62.3 k	60.7 k	59.2 k	57.6 k	56.1 k	54.6 k	53.2 k
Lane load	80.6 k	69.9 k	62.8 k	57.7 k	53.9 k	51.0 k	48.6 k	46.7 k	45.0 k
Total Live Load (PIER)	217.5 k	188.7 k	169.6 k	163.9 k	159.7 k	155.6 k	151.6 k	147.5 k	143.6 k
Total Load									
Superstructure Load (END BENT)	814.8 k	677.7 k	601.9 k	560.6 k	511.0 k	486.8 k	466.5 k	449.0 k	433.7 k
Superstructure Load (PIER)	1206.9 k	914.3 k	753.6 k	675.4 k	582.2 k	539.4 k	504.5 k	475.2 k	450.1 k
Foundation									
Maximum pile spacing	13.0 Ft.								
Service Load Capacity of Piles	260.0 k								
Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.								
Number of Piles Required For END BENT	4	4	4	4	4	4	4	4	4
Number of Piles Required For PIER	5	4	4	4	4	4	4	4	4
Service Design Load (END BENT)	204 k	169 k	150 k	140 k	128 k	122 k	117 k	112 k	108 k
Service Design Load (PIER)	241 k	229 k	188 k	169 k	146 k	135 k	126 k	119 k	113 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ
Alternatives 1, 2 & 4 (Bridges 2 & 3)	**FOUNDATION LOADS on DRILLED SHAFT**	Done by: M. LeComte Checked by: C. Li
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Bridge Width 43.08 Ft. Number of lanes 3 Number of Florida Double Tee = 6

Number of Spans	**4 spans**	**5 spans**	**6 spans**	**7 spans**	**8 spans**	**9 spans**	**10 spans**	**11 spans**	**12 spans**	**13 spans**
Beam Type	IV	III	III	III	II	II	II	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	5 beams	5 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	86.00 Ft.	69.40 Ft.	58.33 Ft.	50.43 Ft.	44.50 Ft.	39.89 Ft.	36.20 Ft.	33.18 Ft.	30.67 Ft.	28.54 Ft.
Beam Span (ft)	84.00 Ft.	67.40 Ft.	56.33 Ft.	48.43 Ft.	42.50 Ft.	37.89 Ft.	34.20 Ft.	31.18 Ft.	28.67 Ft.	26.54 Ft.
Bridge Deck Thickness (in)	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.	8.50 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load										
Beam Load (End Bent)	469.7 k	337.6 k	266.7 k	230.6 k	185.8 k	166.5 k	151.1 k	138.5 k	128.0 k	119.1 k
Beam Load (Pier)	939.4 k	675.2 k	533.5 k	461.2 k	371.6 k	333.1 k	302.3 k	277.1 k	256.1 k	238.3 k
Live Load										
Reduction factor	0.9									
Impact factor for Substructure	1.0									
LL Reaction per lane (END BENT)										
Truck load	64.2 k	62.3 k	60.5 k	58.7 k	56.9 k	55.2 k	53.4 k	51.7 k	50.1 k	48.5 k
Lane load	53.5 k	48.2 k	44.7 k	42.1 k	40.2 k	38.8 k	37.6 k	36.6 k	35.8 k	35.1 k
Total Live Load (END BENT)	173.3 k	168.3 k	163.3 k	158.4 k	153.6 k	148.9 k	144.3 k	139.7 k	135.2 k	130.8 k
LL Reaction per lane (PIER)										
Truck load	65.5 k	63.9 k	62.4 k	60.9 k	59.4 k	58.0 k	56.5 k	55.1 k	53.7 k	52.4 k
Lane load	81.0 k	70.4 k	63.3 k	58.3 k	54.5 k	51.5 k	49.2 k	47.2 k	45.6 k	44.3 k
Total Live Load (PIER)	218.8 k	190.1 k	171.0 k	164.4 k	160.4 k	156.5 k	152.6 k	148.8 k	145.1 k	141.4 k
Total Load										
Superstructure Load (END BENT)	848.2 k	711.0 k	635.2 k	594.2 k	544.6 k	520.6 k	500.6 k	483.4 k	468.4 k	455.1 k
Superstructure Load (PIER)	1235.8 k	942.8 k	782.0 k	703.2 k	609.5 k	567.1 k	532.4 k	503.4 k	478.7 k	457.3 k
Foundation										
Maximum pile spacing	16.0 Ft.									
Location of Ext. shaft from coping at End Bent	6.0 Ft.									
Number of Piles Required For END BENT	3	3	3	3	3	3	3	3	3	3
Number of Piles Required For PIER	2	2	2	2	2	2	2	2	2	2
Service Design Load (END BENT)	283 k	237 k	212 k	198 k	182 k	174 k	167 k	161 k	156 k	152 k
Service Design Load (PIER)	618 k	471 k	391 k	352 k	305 k	284 k	266 k	252 k	239 k	229 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeConte
Alternatives 1, 2 & 4 (Bridges 2 & 3)	INTERMEDIATE BENTS / PIERS	Checked by: C. Li
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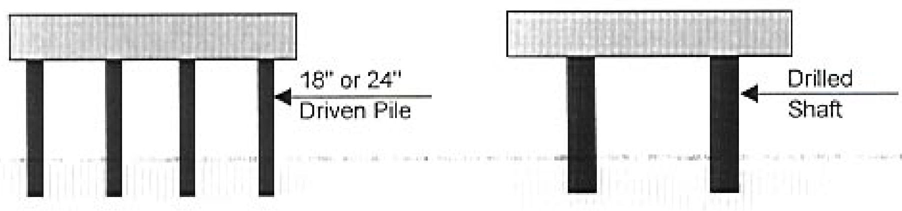

Intermediate Bent Section

Pier Section
(2 Drilled Shafts)

Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
Pile Length Above Ground	8 ft.	8 ft.	8 ft.
Total Length of Pile	27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area	9.0 sq.ft	9.0 sq.ft	12.0 sq.ft
Bent Cap Length	43 ft.	43 ft.	43 ft.
Total Concrete Volume	14.4 CY	14.4 CY	19.1 CY
Reinforcement at 145 lbs/CY	2082 lbs	2082 lbs	2776 lbs
Estimated Cost of Bent Cap	**$6,897**	**$6,897**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	**DRILLED SHAFT**	36 in.
Number of test loads per bridge	2 ea.	2 ea.	Number of test loads per bridge	1 ea.
			Core (Shaft Excavation)	
			Length of temporary casing	
Est. total cost of test piles w/ dynamic load test per bridge	$13,440	$13,440	% of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% of pile hole preformed	100%	100%	Excavation, unclassified extra depth	

Number of Spans	Number of Piles Required 18 in.	24 in.	Number of Drilled Shafts 36 in.	Total Cost of Piles per Bent / Pier 18" Pile	24" Pile	Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier 18" Pile	24" Pile	36" Shaft
4	9	5	2	$14,398	$11,775	$26,347	$21,295	$18,672	$35,543
5	7	4	2	$11,074	$9,196	$22,180	$17,971	$16,093	$31,376
6	6	4	2	$9,300	$8,524	$19,680	$16,197	$15,421	$28,876
7	5	4	2	$7,750	$8,076	$18,013	$14,647	$14,973	$27,209
8	4	4	2	$6,328	$7,756	$16,823	$13,225	$14,653	$26,019
9	4	4	2	$6,088	$7,516	$15,930	$12,985	$14,413	$25,126
10	4	4	2	$5,901	$7,329	$15,236	$12,798	$14,226	$24,431
11	4	4	2	$5,752	$7,180	$14,680	$12,649	$14,077	$23,876
12	4	4	2	$5,630	$7,058	$14,225	$12,527	$13,955	$23,421
13			2			$13,847			$23,043

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBS&J Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 2 & 3)	END BENTS	Checked by: C. Li
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		18 in. Pile	24 in. Pile	36 in. Shaft
	Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
	Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
	Pile Length Above Ground	8 ft.	8 ft.	8 ft.
	Total Length of Pile	27 ft.	27 ft.	22 ft.
	Estimated Cost of One Pile/Drilled Shaft	$891	$1,242	$4,840
	Bent cap cross sectional area	7.5 sq.ft	7.5 sq.ft	12.0 sq.ft
	Bent Cap Length	43 ft.	43 ft.	43 ft.
	Total Concrete Volume	12.0 CY	12.0 CY	19.1 CY
Reinforcement at	145 lbs/CY	1735 lbs	1735 lbs	2776 lbs
	Estimated Cost of Bent Cap	$5,747	$5,747	$9,196

PRESTRESSED PILES	18 in.	24 in.	DRILLED SHAFTS	36 in.
			Core(Shaft Excavation)	
			Length of temporary casing	
			Percentage of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% Pile hole preformed	100%	100%	xcavation, unclassified extra depth	

Number of Spans	Number of Piles Required[1]		Number of Drilled Shafts[2]	Total Cost of Piles per Bent / Pier		Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier		
	18 in.	24 in.	36 in.	18" Pile	24" Pile		18" Pile	24" Pile	36" Shaft
4	8	6	5	$8,816	$8,754	$24,200	$27,951	$27,889	$46,783
5	7	6	5	$7,714	$8,754	$24,200	$24,181	$25,221	$44,115
6	7	6	5	$7,714	$8,754	$24,200	$24,181	$25,221	$44,115
7	6	6	5	$6,612	$8,754	$24,200	$23,079	$25,221	$44,115
8	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
9	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
10	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
11	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
12	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
13			5			$24,200			$41,688

[1]Includes wingwall piles for Type IV, III, II beams.

[2]Includes wingwall drilled shafts for Type IV, III, II beams.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBSJ Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 2 & 3) — **SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISON**	Checked by: C. Li
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Number of Spans	ADJUSTED SPAN LENGTH 18 in. Pile	24 in. Pile	36 in. Shaft	Number of Piers	Cost of Substructure 18 in. Pile	24 in. Pile	36 in. Shaft	Cost of Superstructure 18 in. Pile	24 in. Pile	36 in. Shaft	Total Cost of Structure 18 in. Pile	24 in. Pile	36 in. Shaft
4	84.88 Ft.	85.25 Ft.	86.00 Ft.	3	$119,787	$111,794	$200,195	$296,944	$298,256	$300,880	$416,731	$410,050	$501,075
5	68.20 Ft.	68.60 Ft.	69.40 Ft.	4	$120,245	$114,813	$213,734	$269,271	$270,851	$274,009	$389,516	$385,664	$487,743
6	57.08 Ft.	57.50 Ft.	58.33 Ft.	5	$129,346	$127,546	$232,610	$247,508	$249,315	$252,928	$376,854	$376,861	$485,538
7	49.14 Ft.	49.57 Ft.	50.43 Ft.	6	$134,039	$140,279	$251,486	$248,592	$250,760	$255,096	$382,631	$391,039	$506,582
8	43.19 Ft.	43.63 Ft.	44.50 Ft.	7	$133,878	$148,158	$265,508	$231,710	$234,058	$238,752	$365,588	$382,215	$504,260
9	38.56 Ft.	39.00 Ft.	39.89 Ft.	8	$145,183	$160,891	$284,383	$232,716	$235,399	$240,764	$377,899	$396,290	$525,148
10	34.85 Ft.	35.30 Ft.	36.20 Ft.	9	$156,488	$173,624	$303,259	$233,722	$236,740	$242,776	$390,210	$410,364	$546,035
11	31.82 Ft.	32.27 Ft.	33.18 Ft.	10	$167,793	$186,357	$322,135	$234,728	$238,082	$244,788	$402,521	$424,438	$566,923
12	29.29 Ft.	29.75 Ft.	30.67 Ft.	11	$179,097	$199,089	$341,011	$235,734	$239,423	$246,800	$414,832	$438,512	$587,811
13			28.54 Ft.	12			$359,887			$248,812			$608,699

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

Number of Spans	Estimated Cost	Foundation Alternative	Superstructure Alternative	Number of Spans	Number of Beams	Number of Piles or Drilled Shafts	Total Length of Piles or Drilled Shafts	Number of Test Piles	Total Length of Test Piles
4	$410,050	24 in.	Type IV	4	5	25	675 ft	2	84 ft
5	$385,664	24 in.	Type III	5	5	26	702 ft	2	84 ft
6	$376,854	18 in.	Type III	6	4	42	1134 ft	2	84 ft
7	$382,631	18 in.	Type III	7	4	40	1080 ft	2	84 ft
8	$365,588	18 in.	Type II	8	4	38	1026 ft	2	84 ft
9	$377,899	18 in.	Type II	9	4	42	1134 ft	2	84 ft
10	$390,210	18 in.	Type II	10	4	46	1242 ft	2	84 ft
11	$402,521	18 in.	Type II	11	4	50	1350 ft	2	84 ft
12	$414,832	18 in.	Type II	12	4	54	1458 ft	2	84 ft
13	$608,699	36 in.	Type II	13	4	34	748 ft		

$365,588 <--- Minimum

RESULT OF COST COMPARISON STUDY:

Most economical superstructure type: Type II
Most economical substructure type: 18 in.
Optimum Span Arrangement: 8 spans at 43.19 FT.
Total bridge length: 345.50 Ft.
Total number of beams: 32
Total length of beams: 1382.00 Ft.
Number of piles or drilled Shafts: 38
Length of Piles or drilled Shafts: 1026.00 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1, 2 & 4 (Bridges 2 & 3)	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
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Item	Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:				
Concrete	367.7	CY	$310	$113,994
Reinforcing Steel[1]	75383	LBS	$0.45	$33,922
Bridge Floor Grooving	1536	SY	$2.50	$3,839
Traffic Railing Barrier	691.0	FT	$35	$24,185
Expansion Joints[3]	86.2	FT	$84	$7,238
Type II Beam	1382.0	FT	$54	$74,628
Neoprene Bearing Pads	7.002	CY	$425	$2,976
		Superstructure Subtotal		$260,782
SUBSTRUCTURE:				
Concrete	158.8	CY	$415	$65,916
Reinforcing Steel[2]	23031	LBS	$0.45	$10,364
Pile Hole, Preformed	38	EA	$200	$7,600
Test Piles	84	Ft.	$160	$13,440
18 in. Prestressed Concrete Piles (F & I)	1026	Ft.	$33	$33,858
Pile Splices	4	EA	$110	$440
Drilled shaft		LF	$220	
Test load for drilled shaft		EA	$50,000	
Core (Shaft Excavation)		LF		
Temporary casing		LF		
Casing splice		EA		
Excavation, unclassified shaft		LF		
Drilled shaft sidewall overreaming		LF		
Excavation, unclassified extra depth		LF		
		Substructure Subtotal		$131,618
		Construction Cost Subtotal		**$392,400**
Mobilization (5% of Construction Cost)	1	LS		$ 19,620
Contingency (15% of Construction Cost)	1	LS		$ 58,860
		Total Construction Cost		**$470,880**
		Deck Square Footage (Ft.)		14,885
		Cost Per Square Foot		**$31.63/sf**

[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

[3]Number of expansion piers: 2

Appendix D-3 Alternatives 1 and 2 North Canal Detour

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. Ornarli Checked by: C. Li November 29, 2000
COST SUMMARY	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	
PERMANENT & TEMPORARY STRUCTURES FOR ALTERNATIVES 1 & 2 USING NORTH DETOUR		

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Items		Area	Unit Cost	Cost per Bridge	QTY	Total Cost
		Sq. Ft.	$/Sq.Ft.	$	Ea.	$
APPROACH BRIDGES	(For constr. of first 2 bridges)	50,400	93.74	$4,724,522	4	$18,898,088
APPROACH BRIDGES[1]	(For constr. of next 2 bridges)	50,400	38.98	$1,964,522	4	$7,858,088
TEMPORARY BRIDGES	(For constr. of first 2 bridges)	48,000	99.9	$4,796,437	2	$9,592,875
TEMPORARY BRIDGE[2]	(For constr. of next 2 bridges)	48,000	36.9	$1,771,437	2	$3,542,875
PERMANENT BRIDGES[3]	(Bridges 1 & 4)	20,852	77.0	$1,605,983	2	$3,211,965
PERMANENT BRIDGES[3]	(Bridges 2 & 3)	15,144	77.0	$1,165,583	2	$2,331,165
Removal of APPROACH BRIDGES		50,400	12	$604,800	8	$4,838,400
Removal of TEMPRORARY BRIDGES		48,000	12	$576,000	4	$2,304,000
					TOTAL	$52,577,456

[1] Precast slab units and barrier walls are reused. Only installation cost of these items are included.

[2] Temporary steel truss superstructure is reused. Only installation cost of the superstructure is included.

[3] Top down construction is considered due to limited construction area (Constr. Cost is increased by 20%).

The total construction cost of the temporary bridges for MOT is based on the following assumptions:

1) Two permanent bridges will be built at the same time, which requires 2 temporary bridges. If all 4 permanent bridges are to be built at the same time, cost of additional 2 temporary steel truss bridges need to be considered.
   The total cost above does not include, however, the cost due to longer construction period by constructing 2 bridges at a time, not 4

2) Superstructure of approach bridges and temporary steel truss bridges will be reused.
   Only installation cost of the superstructure is considered for the next 2 bridges.

3) Salvaged value of temporary steel truss bridges is not considered in the total cost above .

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. Omarli
APPROACH BRIDGE	**BEAM SPACING vs. DESIGN SPAN**	Checked by: C. Li
PERMANENT & TEMPORARY STRUCTURES FOR ALTERNATES 1 & 2 USING NORTH DETOUR		November 29, 2000

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SUPERSTRUCTURE OF APPROACH BRIDGE

Bridge Width:	**42.00 Ft.**
Bridge Length:	**1200.00 Ft.**
Precast slab thickness:	**24.00 in.**
Roadway width:	**24.00 Ft.**
Shld. Width on each side:	**4.00 Ft.**
Width of pile cap:	**3.50 Ft.**
Depth of pile cap:	**3.00 Ft.**

SUBSTRUCTURE OF APPROACH BRIDGE

Cap width:	**3.50 Ft.**
Cap depth:	**3.00 Ft.**
Drilled shaft spacing:	**30.00 Ft.**
Drilled shaft length:	**29.00 Ft.**

SUPERSTRUCTURE OF TEMPORARY BRIDGE

Bridge Width:	**32.00 Ft.**
Bridge Length:	**1500.00 Ft.**
Lightweight slab thickness:	**5.00 in.**
Span length:	**30.00 Ft.**

SUBSTRUCTURE OF TEMPORARY BRIDGE

Cap width:	**4.00 Ft.**
Cap depth:	**3.00 Ft.**
No. of drilled shaft per pier:	**2**
Drilled shaft length:	**29.00 Ft.**

SUPERSTRUCTURE OF PERMANENT BRIDGE

Bridge Width:	**32.00 Ft.**
Bridge Length:	**1500.00 Ft.**
Lightweight slab thickness:	**5.00 in.**
Span length:	**30.00 Ft.**

SUBSTRUCTURE OF PERMANENT BRIDGE

Cap width:	**4.00 Ft.**
Cap depth:	**3.00 Ft.**
No. of drilled shaft per pier:	**2**
Drilled shaft length:	**29.00 Ft.**

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. Ornarli
APPROACH BRIDGE	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
PERMANENT & TEMPORARY STRUCTURES FOR ALTERNATIVES 1 & 2 USING NORTH DETOUR		November 29, 2000

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Item		Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:					
Class II Concrete -- (Superstructure)		0	CY	$310.00	$0
Reinforcing Steel -- (Superstructure)[1]		0	LBS	$0.45	$0
Bridge Floor Grooving		5600	SY	$2.50	$14,000
Traffic Railing Barrier		2400.0	FT	$35.00	$84,000
Expansion Joints		0.0	FT	$84.00	$0
Precast Slab	(24 in. thick)	3733.3	CY	$750.00	$2,800,000
Neoprene Bearing Pads		41.7	CF	$425.00	$17,708
				Superstructure Subtotal	$2,915,708
SUBSTRUCTURE:					
Class II Concrete -- (Substructure)		933	CY	$415.00	$387,333
Reinforcing Steel -- (Substructure)[2]		135333	LBS	$0.45	$60,900
Pile Hole, Preformed		0	EA	$200.00	$0
Test Piles		0	Ft.	$160.00	$0
Prestressed Concrete Piles (F & I)		0	Ft.	$33.00	$0
Pile Splices		0	EA	$110.00	$0
Drilled shaft		2378	LF	$220.00	$523,160
Test load for drilled shaft		1	EA	$50,000.00	$50,000
Core(Shaft Excavation)		0	LF	$0.00	$0
Temporary casing		0	LF	$0.00	$0
Casing splice(Included in shaft price)		0	EA	$0.00	$0
Excavation, unclassified shaft		0	LF	$0.00	$0
Drilled shaft sidewall overreaming		0	LF	$0.00	$0
Excavation, unclassified extra depth		0	LF	$0.00	$0
				Substructure Subtotal	$1,021,393
				Construction Cost Subtotal	**$3,937,102**
Mobilization (5% of Construction Cost)		1	LS		$196,855
Contingency (15% of Construction Cost)		1	LS		$590,565.25
				Total Construction Cost	**$4,724,522**
				Deck Square Footage (Ft.)	50,400
				Cost Per Square Foot	**$93.74 /Sf**

[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. Ornarli
APPROACH BRIDGE (REUSE OF DECK)	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
PERMANENT & TEMPORARY STRUCTURES FOR ALTERNATIVES 1 & 2 USING NORTH DETOUR		November 29, 2000

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Item		Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:					
Class II Concrete -- (Superstructure)		0	CY	$310.00	$0
Reinforcing Steel -- (Superstructure)[1]		0	LBS	$0.45	$0
Bridge Floor Grooving		5600	SY	$2.50	$14,000
Traffic Railing Barrier		2400.0	FT	$10.00	$24,000 (Installation)
Expansion Joints		0.0	FT	$84.00	$0
Precast Slab	(24 in. thick)	3733.3	CY	$150.00	$560,000 (Installation)
Neoprene Bearing Pads		41.7	CF	$425.00	$17,708
				Superstructure Subtotal	$615,708
SUBSTRUCTURE:					
Class II Concrete -- (Substructure)		933	CY	$415.00	$387,333
Reinforcing Steel -- (Substructure)[2]		135333	LBS	$0.45	$60,900
Pile Hole, Preformed		0	EA	$200.00	$0
Test Piles		0	Ft.	$160.00	$0
Prestressed Concrete Piles (F & I)		0	Ft.	$33.00	$0
Pile Splices		0	EA	$110.00	$0
Drilled shaft		2378	LF	$220.00	$523,160
Test load for drilled shaft		1	EA	$50,000.00	$50,000
Core(Shaft Excavation)		0	LF	$0.00	$0
Temporary casing		0	LF	$0.00	$0
Casing splice(Included in shaft price)		0	EA	$0.00	$0
Excavation, unclassified shaft		0	LF	$0.00	$0
Drilled shaft sidewall overreaming		0	LF	$0.00	$0
Excavation, unclassified extra depth		0	LF	$0.00	$0
				Substructure Subtotal	$1,021,393
				Construction Cost Subtotal	**$1,637,102**
Mobilization (5% of Construction Cost)		1	LS		$81,855
Contingency (15% of Construction Cost)		1	LS		$245,565.25
				Total Construction Cost	**$1,964,522**
				Deck Square Footage (Ft.)	50,400
				Cost Per Square Foot	**$38.98 /Sf**

[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBSJ Done by: F. Ornarli
TEMPORARY BRIDGE — ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
PERMANENT & TEMPORARY STRUCTURES FOR ALTERNATIVES 1 & 2 USING NORTH DETOUR	November 29, 2000

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Item	Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:				
Class II Concrete -- (Superstructure)	741	CY	$310.00	$229,630
Reinforcing Steel -- (Superstructure)[1]	151852	LBS	$0.45	$68,333
Bridge Floor Grooving	5333	SY	$2.50	$13,333
Temporary Steel Truss Superstructure	1.0	LS	$3,000,000	$3,000,000
			Superstructure Subtotal	$3,311,296
SUBSTRUCTURE:				
Class II Concrete -- (Substructure)	725	CY	$415.00	$301,013
Reinforcing Steel -- (Substructure)[2]	105173	LBS	$0.45	$47,328
Pile Hole, Preformed	0	EA	$200.00	$0
Test Piles	0	Ft.	$160.00	$0
Prestressed Concrete Piles (F & I)	0	Ft.	$33.00	$0
Pile Splices	0	EA	$110.00	$0
Drilled shaft	2958	LF	$220.00	$650,760
Test load for drilled shaft	1	EA	$50,000.00	$50,000
Core(Shaft Excavation)	0	LF	$0.00	$0
Temporary casing	0	LF	$0.00	$0
Casing splice(Included in shaft price)	0	EA	$0.00	$0
Excavation, unclassified shaft	0	LF	$0.00	$0
Drilled shaft sidewall overreaming	0	LF	$0.00	$0
Excavation, unclassified extra depth	0	LF	$0.00	$0
			Substructure Subtotal	$1,049,101
			Construction Cost Subtotal	**$4,360,398**
Mobilization (5% of Construction Cost)	1	LS		$218,020
Contingency (5% of Construction Cost)	1	LS		$218,020
			Total Construction Cost	**$4,796,437**
			Deck Square Footage (Ft.)	48,000
			Cost Per Square Foot	**$99.9 /Sf**

[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. Ornarli
TEMPORARY BRIDGE (REUSE)	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
PERMANENT & TEMPORARY STRUCTURES FOR ALTERNATIVES 1 & 2 USING NORTH DETOUR		November 29, 2000

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Item	Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:				
Class II Concrete -- (Superstructure)	741	CY	$310.00	$229,630
Reinforcing Steel -- (Superstructure)[1]	151852	LBS	$0.45	$68,333
Bridge Floor Grooving	5333	SY	$2.50	$13,333
Temporary Steel Truss Superstructure	1.0	LS	$250,000	$250,000 (Installation)
			Superstructure Subtotal	$561,296
SUBSTRUCTURE:				
Class II Concrete -- (Substructure)	725	CY	$415.00	$301,013
Reinforcing Steel -- (Substructure)[2]	105173	LBS	$0.45	$47,328
Pile Hole, Preformed	0	EA	$200.00	$0
Test Piles	0	Ft.	$160.00	$0
Prestressed Concrete Piles (F & I)	0	Ft.	$33.00	$0
Pile Splices	0	EA	$110.00	$0
Drilled shaft	2958	LF	$220.00	$650,760
Test load for drilled shaft	1	EA	$50,000.00	$50,000
Core(Shaft Excavation)	0	LF	$0.00	$0
Temporary casing	0	LF	$0.00	$0
Casing splice(Included in shaft price)	0	EA	$0.00	$0
Excavation, unclassified shaft	0	LF	$0.00	$0
Drilled shaft sidewall overreaming	0	LF	$0.00	$0
Excavation, unclassified extra depth	0	LF	$0.00	$0
			Substructure Subtotal	$1,049,101
			Construction Cost Subtotal	**$1,610,398**
Mobilization (5% of Construction Cost)	1	LS		$80,520
Contingency (5% of Construction Cost)	1	LS		$80,520
			Total Construction Cost	**$1,771,437**
			Deck Square Footage (Ft.)	48,000
			Cost Per Square Foot	**$36.90 /Sf**

[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: **M. LeComte**

Alternatives 1 & 2 (Bridges 1 & 4) | **BRIDGE AND SPAN LENGTHS**

Checked by: **C. Li**

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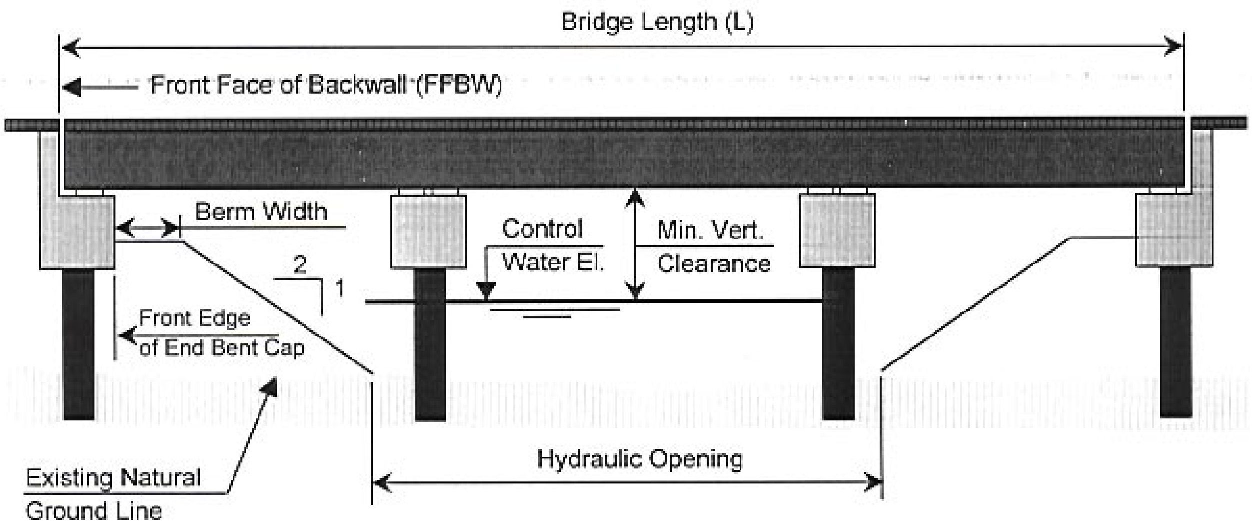
November 29, 2000

Determine Bridge Length based on hydraulic opening:



Hydraulic Opening Width at Natural Ground Level	425.00 Ft.
Natural Ground Elevation	5.00 Ft.
Control Water Elevation	7.50 Ft.
Minimum Clearance over Control Water Elevation	6.00 Ft.
Berm Width	3.00 Ft.
Vertical Distance from bottom of beams to top of Berm where slope starts	2.25 Ft.
Distance From FFBW to Front Edge of End Bent Cap	2.00 Ft.
Minimum Span length	28.00 Ft.
Preliminary Bridge Length (No adjustment due to pile/drilled shaft in the opening), L' =	**460.00 Ft.**

Number of Spans	ADJUSTED BRIDGE LENGTH (L)			ADJUSTED SPAN LENGTH		
	18 in. Pile	24 in. Pile	36 in. Drilled Shaft	18 in. Pile	24 in. Pile	36 in. Drilled Shaft
14	479.50 Ft.	486.00 Ft.	499.00 Ft.	34.25 Ft.	34.71 Ft.	35.64 Ft.
15	481.00 Ft.	488.00 Ft.	502.00 Ft.	32.07 Ft.	32.53 Ft.	33.47 Ft.
16	482.50 Ft.	490.00 Ft.	505.00 Ft.	30.16 Ft.	30.63 Ft.	31.56 Ft.
17	484.00 Ft.	492.00 Ft.	508.00 Ft.	28.47 Ft.	28.94 Ft.	29.88 Ft.
18	485.50 Ft.	494.00 Ft.	511.00 Ft.			28.39 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBS&J Done by: M. LeComte
Alternatives 1 & 2 (Bridges 1 & 4	**BEAM SPACING vs. DESIGN SPAN**	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type A Bridges 1 and 4 TOPDOWN.xls]BEAM-INP		November 29, 2000

Determine beam spacing and design span:

Bridge Width: 43.08 Ft.
Slab Thickness: 8.50 in.

Number of Beams	[1]Beam Spacing	[2]Design Span					
		AASHTO Type II	AASHTO Type III	AASHTO Type IV	18" Double T	24" Double T	30" Double T
4	10.77 Ft.	**46.00 Ft.**	**65.00 Ft.**	**84.00 Ft.**			
5	8.62 Ft.	**52.00 Ft.**	**73.00 Ft.**	**90.00 Ft.**			
6	7.18 Ft.	**58.00 Ft.**	**78.00 Ft.**	**96.00 Ft.**	**40.00 Ft.**	**50.00 Ft.**	**60.00 Ft.**
7	6.15 Ft.	**62.00 Ft.**	**82.00 Ft.**	**98.00 Ft.**			
8	5.39 Ft.	**66.00 Ft.**	**84.00 Ft.**	**102.00 Ft.**			

[1]Beam spacing is based on assuming the cantilever to be half of the beam spacing.

[2]Design spans are determined from the charts based on the beam spacing given.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1 & 2 (Bridges 1 & 4)	AASHTO BEAMS COMPARISON	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type A Bridges 1 and 4 TOPDOWN.xls]BEAM-1		November 29, 2000

Number of Spans	Adjusted Span Length			Number of AASHTO Beams Required								
	PILES		Drilled	18" Piles			24" Piles			Drilled Shaft		
	18 in.	24 in.	Shaft	II	III	IV	II	III	IV	II	III	IV
14	34.25 Ft.	34.71 Ft.	35.64 Ft.	4	4	4	4	4	4	4	4	4
15	32.07 Ft.	32.53 Ft.	33.47 Ft.	4	4	4	4	4	4	4	4	4
16	30.16 Ft.	30.63 Ft.	31.56 Ft.	4	4	4	4	4	4	4	4	4
17	28.47 Ft.	28.94 Ft.	29.88 Ft.	4	4	4	4	4	4	4	4	4
18			28.39 Ft.							4	4	4

Number of Spans	Estimated Construction Cost of AASHTO Beams								
	18 in. Piles			24 in. Piles			DRILLED SHAFT		
	II	III	IV	II	III	IV	II	III	IV
14	$103,572	$128,506	$161,112	$104,976	$130,248	$163,296	$107,784	$133,732	$167,664
15	$103,896	$128,908	$161,616	$105,408	$130,784	$163,968	$108,432	$134,536	$168,672
16	$104,220	$129,310	$162,120	$105,840	$131,320	$164,640	$109,080	$135,340	$169,680
17	$104,544	$129,712	$162,624	$106,272	$131,856	$165,312	$109,728	$136,144	$170,688
18	N/A	N/A	N/A	N/A	N/A	N/A	$110,376	$136,948	$171,696

Number of Spans	Most Economical AASHTO Beam Type					
	18" PILES		24" PILES		DRILLED SHAFT	
	TYPE	COST	TYPE	COST	TYPE	COST
14	II	$103,572	II	$104,976	II	$107,784
15	II	$103,896	II	$105,408	II	$108,432
16	II	$104,220	II	$105,840	II	$109,080
17	II	$104,544	II	$106,272	II	$109,728
18					II	$110,376

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: M. LeComte

Alternatives 1 & 2 (Bridges 1 & 4)

SUPERSTRUCTURE ALTERNATIVES COMPARISON

Checked by: C. Li

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November 29, 2000

Number	AASHTO BEAMS WITH DECK						Florida Double Tee Beams					
of	18" PILES		24" PILES		DRILLED SHAF		18" PILES		24" PILES		DRILLED SHAF	
Spans	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST
14	II	$321,578	II	$325,937	II	$334,655	FDT18	$517,860	FDT18	$524,880	FDT18	$538,920
15	II	$322,584	II	$327,278	II	$336,667	FDT18	$519,480	FDT18	$527,040	FDT18	$542,160
16	II	$323,590	II	$328,620	II	$338,679	FDT18	$521,100	FDT18	$529,200	FDT18	$545,400
17	II	$324,596	II	$329,961	II	$340,691	FDT18	$522,720	FDT18	$531,360	FDT18	$548,640
18					II	$342,703					FDT18	$551,880

Deck Reinforcement 205 lbs/CY concrete
Cost of Deck per foot $455/ft.

Number	PRECAST SLAB						MOST ECONOMICAL SUPERSTRUCTURE ALTERNATIVE								
of	18" PILES		24" PILES		DRILLED SHAF		18 in. Pile			24 in. Pile			36 in. Shaft		
Spans	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost
14	21	$1,004,231	21	$1,017,844	21	$1,045,070	1	21	$1,004,231	1	21	$1,017,844	1	21	$1,045,070
15	20	$959,402	20	$973,364	20	$1,001,289	1	20	$959,402	1	20	$973,364	1	20	$1,001,289
16	19	$914,274	19	$928,486	19	$956,909	1	19	$914,274	1	19	$928,486	1	19	$956,909
17	18	$868,847	18	$883,208	19	$962,593	1	18	$868,847	1	18	$883,208	1	19	$962,593
18					18	$917,316							1	18	$917,316

PRECAST SLAB ALTERNATIVE IS PREFERRED FOR TOP DOWN CONSTRUCTION REQ'D

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: M. LeCounte
Checked by: C. Li
November 29, 2000

Alternatives 1 & 2 (Bridges 1 & 4)

FOUNDATION LOADS and NUMBER of 18 in. PRESTRESSED PILES

I:\STRUCT\Design\Tamiami-Trail\design\cost analysis\alternative 1&2 northsleeve\[Type A Bridges 1 and 4 TOPDOWN.xls]BEAM-INPUT

Bridge Width 43.08 Ft. Number of lanes 3 Number of Florida Double Tee = 6

	Number of Spans	14 spans	15 spans	16 spans	17 spans
	Beam Type	21	20	19	18
	Beam Weight (k/ft)	11.309 klf	10.771 klf	10.232 klf	9.694 klf
	Number of Beams	1 beams	1 beams	1 beams	1 beams
	Span Length (ft)	34.25 Ft.	32.07 Ft.	30.16 Ft.	28.47 Ft.
	Beam Span (ft)	32.25 Ft.	30.07 Ft.	28.16 Ft.	26.47 Ft.
	Bridge Deck Thickness (in)				
	Comp. Loads (ksf)	0.015 ksf	0.015 ksf	0.015 ksf	0.015 ksf
	Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load					
	Beam Load (End Bent)	218.3 k	195.7 k	175.9 k	158.4 k
	Beam Load (Pier)	436.5 k	391.4 k	351.9 k	316.9 k
Live Load					
	Reduction factor	0.9			
	Impact factor for Substructure	1.0			
LL Reaction per lane (END BENT)					
	Truck load	52.4 k	51.0 k	49.7 k	48.4 k
	Lane load	37.0 k	36.3 k	35.7 k	35.1 k
Total Live Load (END BENT)		141.4 k	137.8 k	134.2 k	130.7 k
LL Reaction per lane (PIER)					
	Truck load	55.6 k	54.5 k	53.4 k	52.3 k
	Lane load	47.9 k	46.5 k	45.3 k	44.2 k
Total Live Load (PIER)		150.3 k	147.2 k	144.3 k	141.3 k
Total Load					
	Superstructure Load (END BENT)	535.8 k	509.6 k	486.3 k	465.2 k
	Superstructure Load (PIER)	644.9 k	596.8 k	554.3 k	516.3 k
Foundation					
	Maximum pile spacing	13.0 Ft.			
	Service Load Capacity of Piles	147.0 k			
	Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.			
	Number of Piles Required For END BENT	4	4	4	4
	Number of Piles Required For PIER	5	5	4	4
	Service Design Load (END BENT)	134 k	127 k	122 k	116 k
	Service Design Load (PIER)	129 k	119 k	139 k	129 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte Checked by: C. Li
Alternatives 1 & 2 (Bridges 1 & 4)	**FOUNDATION LOADS and NUMBER of 24 in. PRESTRESSED PILES**	November 29, 2000

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type A Bridges 1 and 4 TOPDOWN.xls]BEAM-INPUT

Bridge Width 43.08 Ft.	Number of lanes 3	Number of Florida Double Tee = 6

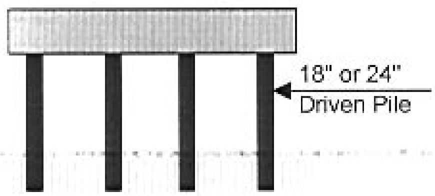
	Number of Spans	**14 spans**	**15 spans**	**16 spans**	**17 spans**
	Beam Type	21	20	19	18
	Beam Weight (k/ft)	11.309 klf	10.771 klf	10.232 klf	9.694 klf
	Number of Beams	1 beams	1 beams	1 beams	1 beams
	Span Length (ft)	34.71 Ft.	32.53 Ft.	30.63 Ft.	28.94 Ft.
	Beam Span (ft)	32.71 Ft.	30.53 Ft.	28.63 Ft.	26.94 Ft.
	Bridge Deck Thickness (in)				
	Comp. Loads (ksf)	0.015 ksf	0.015 ksf	0.015 ksf	0.015 ksf
	Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load					
	Beam Load (End Bent)	221.2 k	198.6 k	178.7 k	161.1 k
	Beam Load (Pier)	442.4 k	397.1 k	357.3 k	322.1 k
Live Load					
	Reduction factor	0.9			
	Impact factor for Substructure	1.0			
LL Reaction per lane (END BENT)					
	Truck load	52.6 k	51.3 k	50.1 k	48.8 k
	Lane load	37.1 k	36.4 k	35.8 k	35.3 k
Total Live Load (END BENT)		142.1 k	138.6 k	135.2 k	131.7 k
LL Reaction per lane (PIER)					
	Truck load	55.9 k	54.8 k	53.7 k	52.7 k
	Lane load	48.2 k	46.8 k	45.6 k	44.5 k
Total Live Load (PIER)		150.8 k	147.9 k	145.0 k	142.2 k
Total Load					
	Superstructure Load (END BENT)	539.5 k	513.3 k	489.9 k	468.9 k
	Superstructure Load (PIER)	651.5 k	603.2 k	560.5 k	522.4 k
Foundation					
	Maximum pile spacing	13.0 Ft.			
	Service Load Capacity of Piles	**260.0 k**			
	Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.			
	Number of Piles Required For END BENT	4	4	4	4
	Number of Piles Required For PIER	4	4	4	4
	Service Design Load (END BENT)	135 k	128 k	122 k	117 k
	Service Design Load (PIER)	163 k	151 k	140 k	131 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1 & 2 (Bridges 1 & 4)	**FOUNDATION LOADS on DRILLED SHAFT**	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type A Bridges 1 and 4 TOPDOWN.xls]BEAM-INPUT		November 29, 2000

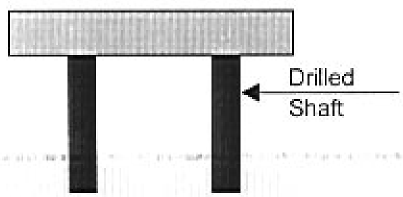
Bridge Width 43.08 Ft. Number of lanes 3 Number of Florida Double Tee = 6

Number of Spans	14 spans	15 spans	16 spans	17 spans	18 spans
Beam Type	21	20	19	19	18
Beam Weight (k/ft)	11.309 klf	10.771 klf	10.232 klf	10.232 klf	9.694 klf
Number of Beams	1 beams	1 beams	1 beams	1 beams	1 beams
Span Length (ft)	35.64 Ft.	33.47 Ft.	31.56 Ft.	29.88 Ft.	28.39 Ft.
Beam Span (ft)	33.64 Ft.	31.47 Ft.	29.56 Ft.	27.88 Ft.	26.39 Ft.
Bridge Deck Thickness (in)					
Comp. Loads (ksf)	0.015 ksf	0.015 ksf	0.015 ksf	0.015 ksf	0.015 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load					
Beam Load (End Bent)	227.1 k	204.3 k	184.1 k	174.3 k	158.0 k
Beam Load (Pier)	454.3 k	408.5 k	368.3 k	348.7 k	316.0 k
Live Load					
Reduction factor	0.9				
Impact factor for Substructure	1.0				
LL Reaction per lane (END BENT)					
Truck load	53.1 k	51.9 k	50.7 k	49.5 k	48.3 k
Lane load	37.4 k	36.7 k	36.1 k	35.6 k	35.1 k
Total Live Load (END BENT)	143.5 k	140.2 k	136.9 k	133.7 k	130.5 k
LL Reaction per lane (PIER)					
Truck load	56.3 k	55.3 k	54.3 k	53.3 k	52.3 k
Lane load	48.8 k	47.4 k	46.2 k	45.1 k	44.2 k
Total Live Load (PIER)	152.0 k	149.2 k	146.5 k	143.8 k	141.1 k
Total Load					
Superstructure Load (END BENT)	575.8 k	549.6 k	526.2 k	513.2 k	493.7 k
Superstructure Load (PIER)	683.8 k	635.3 k	592.3 k	570.0 k	534.7 k
Foundation					
Maximum pile spacing	16.0 Ft.				
Location of Ext. shaft from coping at End Bent	6.0 Ft.				
Number of Piles Required For END BENT	3	3	3	3	3
Number of Piles Required For PIER	2	2	2	2	2
Service Design Load (END BENT)	192 k	183 k	175 k	171 k	165 k
Service Design Load (PIER)	342 k	318 k	296 k	285 k	267 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project **Preparation of Engineering Appendix For GRR/SEIS** Corps of Engineers, Jacksonville, Florida		**PBSJ** Done by: M. LeComte
Alternatives 1 & 2 (Bridges 1 & 4)	**INTERMEDIATE BENTS / PIERS**	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 north\detour\[Type A Bridges 1 and 4 TOPDOWN.xls]BEAM-INPUT		November 29, 2000



Intermediate Bent Section



Pier Section
(2 Drilled Shafts)

Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
Pile Length Above Ground	8 ft.	8 ft.	8 ft.
Total Length of Pile	27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area	9.0 sq.ft	9.0 sq.ft	12.0 sq.ft
Bent Cap Length	43 ft.	43 ft.	43 ft.
Total Concrete Volume	14.4 CY	14.4 CY	19.1 CY
Reinforcement at 145 lbs/CY	2082 lbs	2082 lbs	2776 lbs
Estimated Cost of Bent Cap	**$6,897**	**$6,897**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	**DRILLED SHAFT**	36 in.
Number of test loads per bridge	3 ea.	3 ea.	Number of test loads per bridge	1 ea.
			Core (Shaft Excavation)	
			Length of temporary casing	
Est. total cost of test piles w/ dynamic load test per bridge	$20,160	$20,160	% of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% of pile hole preformed	100%	100%	Excavation, unclassified extra depth	

Number of Spans	Number of Piles Required 18 in.	Number of Piles Required 24 in.	Number of Drilled Shafts 36 in.	Total Cost of Piles per Bent / Pier 18" Pile	Total Cost of Piles per Bent / Pier 24" Pile	Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier 18" Pile	Total Estimated Cost of ONE Pier 24" Pile	Total Estimated Cost of ONE Pier 36" Shaft
14	5	4	2	$7,061	$7,387	$13,526	$13,958	$14,284	$22,722
15	5	4	2	$6,950	$7,276	$13,251	$13,847	$14,173	$22,447
16	4	4	2	$5,752	$7,180	$13,013	$12,649	$14,077	$22,209
17	4	4	2	$5,668	$7,096	$12,805	$12,565	$13,993	$22,001
18			2			$12,621			$21,817

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1 & 2 (Bridges 1 & 4)	END BENTS	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type A Bridges 1 and 4 TOPDOWN.xls]BEA		November 29, 2000

	Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
	Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
	Pile Length Above Ground	8 ft.	8 ft.	8 ft.
	Total Length of Pile	27 ft.	27 ft.	22 ft.
	Estimated Cost of One Pile/Drilled Shaft	$891	$1,242	$4,840
	Bent cap cross sectional area	7.5 sq.ft	7.5 sq.ft	12.0 sq.ft
	Bent Cap Length	43 ft.	43 ft.	43 ft.
	Total Concrete Volume	12.0 CY	12.0 CY	19.1 CY
Reinforcement at	145 lbs/CY	1735 lbs	1735 lbs	2776 lbs
	Estimated Cost of Bent Cap	$5,747	$5,747	$9,196

PRESTRESSED PILES	18 in.	24 in.	DRILLED SHAFTS	36 in.
			Core(Shaft Excavation)	
			Length of temporary casing	
			Percentage of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% Pile hole preformed	100%	100%	xcavation, unclassified extra depth	

Number of Spans	Number of Piles Required[1] 18 in.	Number of Piles Required[1] 24 in.	Number of Drilled Shafts[2] 36 in.	Total Cost of Piles per Bent / Pier 18" Pile	Total Cost of Piles per Bent / Pier 24" Pile	Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier 18" Pile	Total Estimated Cost of ONE Pier 24" Pile	Total Estimated Cost of ONE Pier 36" Shaft
14	4	4	3	$4,408	$5,836	$14,520	$10,155	$11,583	$23,716
15	4	4	3	$4,408	$5,836	$14,520	$10,155	$11,583	$23,716
16	4	4	3	$4,408	$5,836	$14,520	$10,155	$11,583	$23,716
17	4	4	3	$4,408	$5,836	$14,520	$10,155	$11,583	$23,716
18			3			$14,520			$23,716

[1]Includes wingwall piles for Type IV, III, II beams.

[2]Includes wingwall drilled shafts for Type IV, III, II beams.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBS&J Done by: M. LeConte
Alternatives 1 & 2 (Bridges 1 & 4) — **SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISON**	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type A Bridges 1 and 4 TOPDOWN.xls]BEAM-INPUT	November 29, 2000

Number	ADJUSTED SPAN LENGTH			Number	Cost of Substructure			Cost of Superstructure			Total Cost of Structure		
of Spans	18 in. Pile	24 in. Pile	36 in. Shaft	of Piers	18 in. Pile	24 in. Pile	36 in. Shaft	18 in. Pile	24 in. Pile	36 in. Shaft	18 in. Pile	24 in. Pile	36 in. Shaft
14	34.25 Ft.	34.71 Ft.	35.64 Ft.	13	$201,761	$208,855	$342,818	$1,004,231	$1,017,844	$1,045,070	$1,205,991	$1,226,699	$1,387,888
15	32.07 Ft.	32.53 Ft.	33.47 Ft.	14	$214,168	$221,588	$361,694	$959,402	$973,364	$1,001,289	$1,173,570	$1,194,952	$1,362,983
16	30.16 Ft.	30.63 Ft.	31.56 Ft.	15	$210,045	$234,321	$380,570	$914,274	$928,486	$956,909	$1,124,319	$1,162,806	$1,337,479
17	28.47 Ft.	28.94 Ft.	29.88 Ft.	16	$221,350	$247,054	$399,446	$868,847	$883,208	$962,593	$1,090,197	$1,130,262	$1,362,040
18			28.39 Ft.	17			$418,322			$917,316			$1,335,638

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

Number of Spans	Estimated Cost	Foundation Alternative	Superstructure Alternative	Number of Spans	Number of Beams	Number of Piles or Drilled Shafts	Total Length of Piles or Drilled Shafts	Number of Test Piles	Total Length of Test Piles
14	#########	18 in.	21	14	1	70	1890 ft	3	126 ft
15	#########	18 in.	20	15	1	75	2025 ft	3	126 ft
16	#########	18 in.	19	16	1	65	1755 ft	3	126 ft
17	#########	18 in.	18	17	1	69	1863 ft	3	126 ft
18	#########	36 in.	18	18	1	40	880 ft		

######### <--- Minimum

RESULT OF COST COMPARISON STUDY:

Most economical superstructure type: 18 in. thick precast slab
Most economical substructure type: 18 in.
Optimum Span Arrangement: 17 spans at 28.47 FT.
Total bridge length: 484.00 Ft.
Total number of beams: N/A
Total length of beams: N/A
Number of piles or drilled Shafts: 69
Length of Piles or drilled Shafts: 1863.00 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBS&J Done by: M. LeConte
Alternatives 1 & 2 (Bridges 1 & 4)	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type A Bridges 1 and 4 TOPDOW		November 29, 2000

Item	Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:				
Concrete	0	CY	$310	
Reinforcing Steel[1]	0	LBS	$0.45	
Bridge Floor Grooving	2151	SY	$2.50	$5,378
Traffic Railing Barrier	968.0	FT	$35	$33,880
Expansion Joints[3]	86.2	FT	$84	$7,238
18 in. thick precast slab	1158.5	CY	$750	$868,847
Neoprene Bearing Pads	32.313	CF	$425	$13,733
		Superstructure Subtotal		$929,076
SUBSTRUCTURE:				
Concrete	253.7	CY	$415	$105,291
Reinforcing Steel[2]	36788	LBS	$0.45	$16,555
Pile Hole, Preformed	69	EA	$200	$13,800
Test Piles	126	Ft.	$160	$20,160
18 in. Prestressed Concrete Piles (F & I)	1863	Ft.	$33	$61,479
Pile Splices	7	EA	$110	$770
Drilled shaft	0	LF	$220	
Test load for drilled shaft	0	EA	$50,000	
Core (Shaft Excavation)	0	LF		
Temporary casing	0	LF		
Casing splice	0	EA		
Excavation, unclassified shaft	0	LF		
Drilled shaft sidewall overreaming	0	LF		
Excavation, unclassified extra depth	0	LF		
		Substructure Subtotal		$218,055
		Construction Cost Subtotal		**$1,147,131**
Mobilization (5% of Construction Cost)	1	LS		$ 57,357
Contingency (15% of Construction Cost)	1	LS		$ 172,070
TOP DOWN Construction (20% of Construction Cost)	1	LS		$ 229,426
		Total Construction Cost		**$1,605,983**
		Deck Square Footage (Ft.)		20,852
		Cost Per Square Foot		**$77.02/sf**

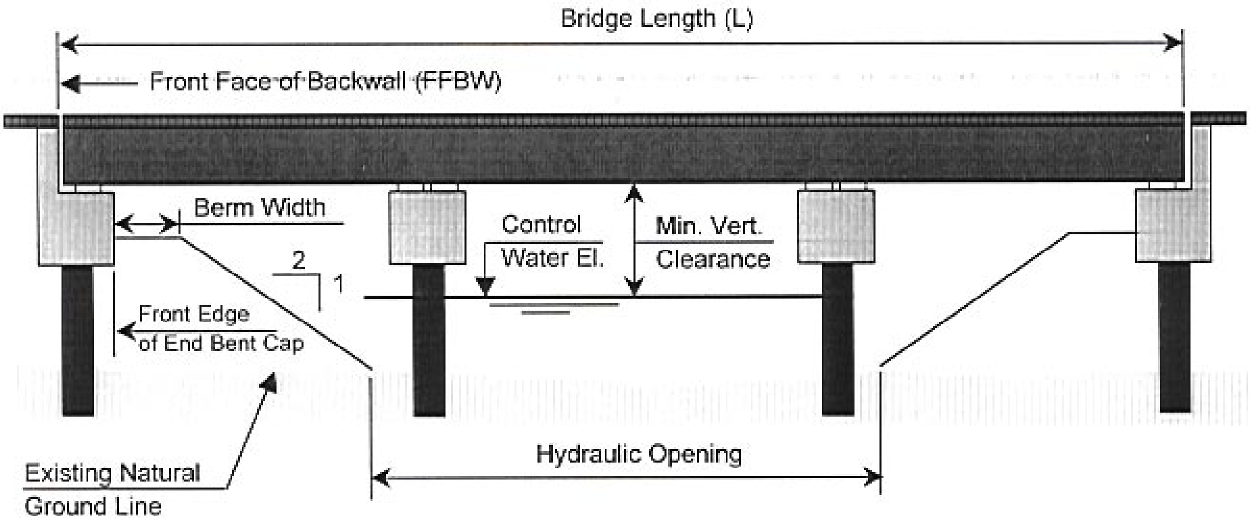
[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

[3]Number of expansion piers: 2

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1 & 2 (Bridges 2 & 3)	BRIDGE AND SPAN LENGTHS	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type B Bridges 2 and 3 TOPD		November 29, 2000

Determine Bridge Length based on hydraulic opening:



Hydraulic Opening Width at Natural Ground Level	300.00 Ft.
Natural Ground Elevation	5.00 Ft.
Control Water Elevation	7.50 Ft.
Minimum Clearance over Control Water Elevation	6.00 Ft.
Berm Width	3.00 Ft.
Vertical Distance from bottom of beams to top of Berm where slope starts	2.25 Ft.
Distance From FFBW to Front Edge of End Bent Cap	2.00 Ft.
Minimum Span length	28.00 Ft.
Preliminary Bridge Length (No adjustment due to pile/drilled shaft in the opening), L' =	**335.00 Ft.**

Number of Spans	ADJUSTED BRIDGE LENGTH (L)			ADJUSTED SPAN LENGTH		
	18 in. Pile	24 in. Pile	36 in. Drilled Shaft	18 in. Pile	24 in. Pile	36 in. Drilled Shaft
10	348.50 Ft.	353.00 Ft.	362.00 Ft.	34.85 Ft.	35.30 Ft.	36.20 Ft.
11	350.00 Ft.	355.00 Ft.	365.00 Ft.	31.82 Ft.	32.27 Ft.	33.18 Ft.
12	351.50 Ft.	357.00 Ft.	368.00 Ft.	29.29 Ft.	29.75 Ft.	30.67 Ft.
13	353.00 Ft.	359.00 Ft.	371.00 Ft.			28.54 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1 & 2 (Bridges 2 & 3	BEAM SPACING vs. DESIGN SPAN	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type B Bridges 2 and 3 TOPDOWN.xls]LENGTH		November 29, 2000

Determine beam spacing and design span:

Bridge Width: 43.08 Ft.
Slab Thickness: 8.50 in.

Number of Beams	[1]Beam Spacing	[2]Design Span AASHTO Type II	AASHTO Type III	AASHTO Type IV	18" Double T	24" Double T	30" Double T
4	10.77 Ft.	**46.00 Ft.**	**65.00 Ft.**	**84.00 Ft.**			
5	8.62 Ft.	**52.00 Ft.**	**73.00 Ft.**	**90.00 Ft.**			
6	7.18 Ft.	**58.00 Ft.**	**78.00 Ft.**	**96.00 Ft.**	**40.00 Ft.**	**50.00 Ft.**	**60.00 Ft.**
7	6.15 Ft.	**62.00 Ft.**	**82.00 Ft.**	**98.00 Ft.**			
8	5.39 Ft.	**66.00 Ft.**	**84.00 Ft.**	**102.00 Ft.**			

[1]Beam spacing is based on assuming the cantilever to be half of the beam spacing.

[2]Design spans are determined from the charts based on the beam spacing given.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBS&J Done by: M. LeComte
Alternatives 1 & 2 (Bridges 2 & 3) — **AASHTO BEAMS COMPARISON**	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type B Bridges 2 and 3 TOPDOWN.xls]LENGT	November 29, 2000

Number of Spans	Adjusted Span Length			Number of AASHTO Beams Required								
	PILES		Drilled	18" Piles			24" Piles			Drilled Shaft		
	18 in.	24 in.	Shaft	II	III	IV	II	III	IV	II	III	IV
10	34.85 Ft.	35.30 Ft.	36.20 Ft.	4	4	4	4	4	4	4	4	4
11	31.82 Ft.	32.27 Ft.	33.18 Ft.	4	4	4	4	4	4	4	4	4
12	29.29 Ft.	29.75 Ft.	30.67 Ft.	4	4	4	4	4	4	4	4	4
13			28.54 Ft.							4	4	4

Number of Spans	Estimated Construction Cost of AASHTO Beams								
	18 in. Piles			24 in. Piles			DRILLED SHAFT		
	II	III	IV	II	III	IV	II	III	IV
10	$75,276	$93,398	$117,096	$76,248	$94,604	$118,608	$78,192	$97,016	$121,632
11	$75,600	$93,800	$117,600	$76,680	$95,140	$119,280	$78,840	$97,820	$122,640
12	$75,924	$94,202	$118,104	$77,112	$95,676	$119,952	$79,488	$98,624	$123,648
13	N/A	N/A	N/A	N/A	N/A	N/A	$80,136	$99,428	$124,656

Number of Spans	Most Economical AASHTO Beam Type					
	18" PILES		24" PILES		DRILLED SHAFT	
	TYPE	COST	TYPE	COST	TYPE	COST
10	II	$75,276	II	$76,248	II	$78,192
11	II	$75,600	II	$76,680	II	$78,840
12	II	$75,924	II	$77,112	II	$79,488
13					II	$80,136

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBSJ Done by: M. LeComte
Alternatives 1 & 2 (Bridges 2 & 3) — SUPERSTRUCTURE ALTERNATIVES COMPARISON	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 northdetour\[Type B Bridges 2 and 3 TOP	November 29, 2000

Number of Spans	AASHTO BEAMS WITH DECK						Florida Double Tee Beams					
	18" PILES		24" PILES		DRILLED SHAF		18" PILES		24" PILES		DRILLED SHAF	
	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST
10	II	$233,722	II	$236,740	II	$242,776	FDT18	$376,380	FDT18	$381,240	FDT18	$390,960
11	II	$234,728	II	$238,082	II	$244,788	FDT18	$378,000	FDT18	$383,400	FDT18	$394,200
12	II	$235,734	II	$239,423	II	$246,800	FDT18	$379,620	FDT18	$385,560	FDT18	$397,440
13					II	$248,812					FDT18	$400,680

Deck Reinforcement 205 lbs/CY concrete
Cost of Deck per foot $455/ft.

Number of Spans	PRECAST SLAB						MOST ECONOMICAL SUPERSTRUCTURE ALTERNATIVE								
	18" PILES		24" PILES		DRILLED SHAF		18 in. Pile			24 in. Pile			36 in. Shaft		
	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost
10	21	$729,874	21	$739,298	22	$794,249	1	21	$729,874	1	21	$739,298	1	22	$794,249
11	20	$698,110	20	$708,083	20	$728,029	1	20	$698,110	1	20	$708,083	1	20	$728,029
12	18	$630,991	19	$676,468	19	$697,312	1	18	$630,991	1	19	$676,468	1	19	$697,312
13					18	$665,997							1	18	$665,997

PRECAST SLAB ALTERNATIVE IS PREFERRED FOR TOP DOWN CONSTRUCTION REQ'D

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: M. LeComte
Checked by: C. Li
November 29, 2000

Alternatives 1 & 2 (Bridges 2 & 3)

FOUNDATION LOADS and NUMBER of 18 in. PRESTRESSED PILES

L:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 1&2 north\detour\[Type B Bridges 2 and 3 TOPDOWN.xls]LENGTH

Bridge Width 43.08 Ft. | Number of lanes 3 | Number of Florida Double Tee = 6

	Number of Spans	**10 spans**	**11 spans**	**12 spans**
	Beam Type	21	20	18
	Beam Weight (k/ft)	11.309 klf	10.771 klf	9.694 klf
	Number of Beams	1 beams	1 beams	1 beams
	Span Length (ft)	34.85 Ft.	31.82 Ft.	29.29 Ft.
	Beam Span (ft)	32.85 Ft.	29.82 Ft.	27.29 Ft.
	Bridge Deck Thickness (in)			
	Comp. Loads (ksf)	0.015 ksf	0.015 ksf	0.015 ksf
	Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf
Dead Load				
	Beam Load (End Bent)	222.1 k	194.2 k	163.0 k
	Beam Load (Pier)	444.2 k	388.4 k	326.0 k
Live Load				
	Reduction factor	0.9		
	Impact factor for Substructure	1.0		
LL Reaction per lane (END BENT)				
	Truck load	52.7 k	50.9 k	49.1 k
	Lane load	37.2 k	36.2 k	35.4 k
Total Live Load (END BENT)		142.3 k	137.4 k	132.5 k
LL Reaction per lane (PIER)				
	Truck load	55.9 k	54.4 k	52.9 k
	Lane load	48.3 k	46.4 k	44.7 k
Total Live Load (PIER)		151.0 k	146.9 k	142.8 k
Total Load				
	Superstructure Load (END BENT)	540.5 k	507.7 k	471.6 k
	Superstructure Load (PIER)	653.4 k	593.4 k	527.0 k
Foundation				
	Maximum pile spacing	13.0 Ft.		
	Service Load Capacity of Piles	**147.0 k**		
	Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.		
	Number of Piles Required For END BENT	4	4	4
	Number of Piles Required For PIER	5	5	4
	Service Design Load (END BENT)	135 k	127 k	118 k
	Service Design Load (PIER)	131 k	119 k	132 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
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November 29, 2000

Alternatives 1 & 2 (Bridges 2 & 3)

FOUNDATION LOADS and NUMBER of 24 in. PRESTRESSED PILES

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Bridge Width 43.08 Ft. | Number of lanes 3 | Number of Florida Double Tee = 6

		10 spans	11 spans	12 spans
	Number of Spans	10 spans	11 spans	12 spans
	Beam Type	21	20	19
	Beam Weight (k/ft)	11.309 klf	10.771 klf	10.232 klf
	Number of Beams	1 beams	1 beams	1 beams
	Span Length (ft)	35.30 Ft.	32.27 Ft.	29.75 Ft.
	Beam Span (ft)	33.30 Ft.	30.27 Ft.	27.75 Ft.
	Bridge Deck Thickness (in)			
	Comp. Loads (ksf)	0.015 ksf	0.015 ksf	0.015 ksf
	Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf
Dead Load				
	Beam Load (End Bent)	225.0 k	197.0 k	173.6 k
	Beam Load (Pier)	449.9 k	393.9 k	347.1 k
Live Load				
	Reduction factor	0.9		
	Impact factor for Substructure	1.0		
LL Reaction per lane (END BENT)				
	Truck load	53.0 k	51.2 k	49.4 k
	Lane load	37.3 k	36.3 k	35.5 k
Total Live Load (END BENT)		143.0 k	138.2 k	133.4 k
LL Reaction per lane (PIER)				
	Truck load	56.1 k	54.6 k	53.2 k
	Lane load	48.6 k	46.7 k	45.0 k
Total Live Load (PIER)		151.6 k	147.5 k	143.6 k
Total Load				
	Superstructure Load (END BENT)	544.1 k	511.3 k	483.1 k
	Superstructure Load (PIER)	659.6 k	599.7 k	548.9 k
Foundation				
	Maximum pile spacing	13.0 Ft.		
	Service Load Capacity of Piles	260.0 k		
	Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.		
	Number of Piles Required For END BENT	4	4	4
	Number of Piles Required For PIER	4	4	4
	Service Design Load (END BENT)	136 k	128 k	121 k
	Service Design Load (PIER)	165 k	150 k	137 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
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November 29, 2000

Alternatives 1 & 2 (Bridges 2 & 3)

FOUNDATION LOADS on DRILLED SHAFT

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Bridge Width 43.08 Ft. Number of lanes 3 Number of Florida Double Tee = 6

Number of Spans	10 spans	11 spans	12 spans	13 spans
Beam Type	22	20	19	18
Beam Weight (k/ft)	11.848 klf	10.771 klf	10.232 klf	9.694 klf
Number of Beams	1 beams	1 beams	1 beams	1 beams
Span Length (ft)	36.20 Ft.	33.18 Ft.	30.67 Ft.	28.54 Ft.
Beam Span (ft)	34.20 Ft.	31.18 Ft.	28.67 Ft.	26.54 Ft.
Bridge Deck Thickness (in)				
Comp. Loads (ksf)	0.015 ksf	0.015 ksf	0.015 ksf	0.015 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load				
Beam Load (End Bent)	240.4 k	202.5 k	178.9 k	158.8 k
Beam Load (Pier)	480.9 k	405.0 k	357.8 k	317.6 k
Live Load				
Reduction factor	0.9			
Impact factor for Substructure	1.0			
LL Reaction per lane (END BENT)				
Truck load	53.4 k	51.7 k	50.1 k	48.5 k
Lane load	37.6 k	36.6 k	35.8 k	35.1 k
Total Live Load (END BENT)	141.3 k	139.7 k	135.2 k	130.8 k
LL Reaction per lane (PIER)				
Truck load	56.5 k	55.1 k	53.7 k	52.4 k
Lane load	49.2 k	47.2 k	45.6 k	44.3 k
Total Live Load (PIER)	152.6 k	148.8 k	145.1 k	141.4 k
Total Load				
Superstructure Load (END BENT)	589.9 k	547.4 k	519.3 k	494.8 k
Superstructure Load (PIER)	711.1 k	631.4 k	580.5 k	536.6 k
Foundation				
Maximum pile spacing	16.0 Ft.			
Location of Ext. shaft from coping at End Bent	6.0 Ft.			
Number of Piles Required For END BENT	3	3	3	3
Number of Piles Required For PIER	2	2	2	2
Service Design Load (END BENT)	197 k	182 k	173 k	165 k
Service Design Load (PIER)	356 k	316 k	290 k	268 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBS&J Done by: M. LeComte
Alternatives 1 & 2 (Bridges 2 & 3)	**INTERMEDIATE BENTS / PIERS**	Checked by: C. Li
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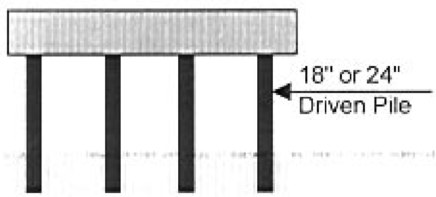
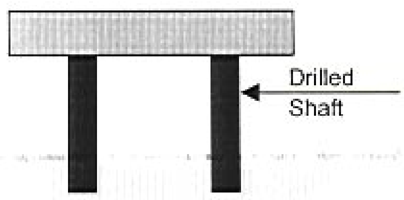


Intermediate Bent Section



Pier Section
(2 Drilled Shafts)

Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
Pile Length Above Ground	8 ft.	8 ft.	8 ft.
Total Length of Pile	27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area	9.0 sq.ft	9.0 sq.ft	12.0 sq.ft
Bent Cap Length	43 ft.	43 ft.	43 ft.
Total Concrete Volume	14.4 CY	14.4 CY	19.1 CY
Reinforcement at 145 lbs/CY	2082 lbs	2082 lbs	2776 lbs
Estimated Cost of Bent Cap	**$6,897**	**$6,897**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	**DRILLED SHAFT**	36 in.
Number of test loads per bridge	2 ea.	2 ea.	Number of test loads per bridge	1 ea.
			Core (Shaft Excavation)	
			Length of temporary casing	
Est. total cost of test piles w/ dynamic load test per bridge	$13,440	$13,440	% of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% of pile hole preformed	100%	100%	Excavation, unclassified extra depth	

Number of Spans	Number of Piles Required		Number of Drilled Shafts	Total Cost of Piles per Bent / Pier		Total Cost of Drilled Shaft	Total Estimated Cost of ONE Pier		
	18 in.	24 in.	36 in.	18" Pile	24" Pile	per Pier	18" Pile	24" Pile	36" Shaft
10	5	4	2	$7,003	$7,329	$15,236	$13,900	$14,226	$24,431
11	5	4	2	$6,854	$7,180	$14,680	$13,751	$14,077	$23,876
12	4	4	2	$5,630	$7,058	$14,225	$12,527	$13,955	$23,421
13			2			$13,847			$23,043

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBS&J Done by: M. LeComte
Alternatives 1 & 2 (Bridges 2 & 3)	END BENTS	Checked by: C. Li
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Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
Pile Length Above Ground	8 ft.	8 ft.	8 ft.
Total Length of Pile	27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area	7.5 sq.ft	7.5 sq.ft	12.0 sq.ft
Bent Cap Length	43 ft.	43 ft.	43 ft.
Total Concrete Volume	12.0 CY	12.0 CY	19.1 CY
Reinforcement at 145 lbs/CY	1735 lbs	1735 lbs	2776 lbs
Estimated Cost of Bent Cap	**$5,747**	**$5,747**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	DRILLED SHAFTS	36 in.
			Core(Shaft Excavation)	
			Length of temporary casing	
			Percentage of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% Pile hole preformed	100%	100%	xcavation, unclassified extra depth	

Number of Spans	Number of Piles Required[1]		Number of Drilled Shafts[2]	Total Cost of Piles per Bent / Pier		Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier		
	18 in.	24 in.	36 in.	18" Pile	24" Pile		18" Pile	24" Pile	36" Shaft
10	4	4	3	$4,408	$5,836	$14,520	$10,155	$11,583	$23,716
11	4	4	3	$4,408	$5,836	$14,520	$10,155	$11,583	$23,716
12	4	4	3	$4,408	$5,836	$14,520	$10,155	$11,583	$23,716
13			3			$14,520			$23,716

[1]Includes wingwall piles for Type IV, III, II beams.

[2]Includes wingwall drilled shafts for Type IV, III, II beams.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1 & 2 (Bridges 2 & 3)	**SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISON**	Checked by: C. Li
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Number	ADJUSTED SPAN LENGTH			Number	Cost of Substructure			Cost of Superstructure			Total Cost of Structure		
of Spans	18 in. Pile	24 in. Pile	36 in. Shaft	of Piers	18 in. Pile	24 in. Pile	36 in. Shaft	18 in. Pile	24 in. Pile	36 in. Shaft	18 in. Pile	24 in. Pile	36 in. Shaft
10	34.85 Ft.	35.30 Ft.	36.20 Ft.	9	$145,413	$151,203	$267,315	$729,874	$739,298	$794,249	$875,287	$890,501	$1,061,564
11	31.82 Ft.	32.27 Ft.	33.18 Ft.	10	$157,820	$163,936	$286,191	$698,110	$708,083	$728,029	$855,930	$872,019	$1,014,219
12	29.29 Ft.	29.75 Ft.	30.67 Ft.	11	$158,105	$176,669	$305,067	$630,991	$676,468	$697,312	$789,096	$853,137	$1,002,378
13			28.54 Ft.	12			$323,943			$665,997			$989,939

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

Number of Spans	Estimated Cost	Foundation Alternative	Superstructure Alternative	Number of Spans	Number of Beams	Number of Piles or Drilled Shafts	Total Length of Piles or Drilled Shafts	Number of Test Piles	Total Length of Test Piles
10	$875,287	18 in.	21	10	1	51	1377 ft	2	84 ft
11	$855,930	18 in.	20	11	1	56	1512 ft	2	84 ft
12	$789,096	18 in.	18	12	1	50	1350 ft	2	84 ft
13	$989,939	36 in.	18	13	1	30	660 ft		

$789,096 <--- Minimum

RESULT OF COST COMPARISON STUDY:

Most economical superstructure type: 18 in. thick precast slab
Most economical substructure type: 18 in.
Optimum Span Arrangement: 12 spans at 29.29 FT.
Total bridge length: 351.50 Ft.
Total number of beams: N/A
Total length of beams: N/A
Number of piles or drilled Shafts: 50
Length of Piles or drilled Shafts: 1350.00 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternatives 1 & 2 (Bridges 2 & 3)	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
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Item	Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:				
Concrete	0	CY	$310	
Reinforcing Steel[1]	0	LBS	$0.45	
Bridge Floor Grooving	1562	SY	$2.50	$3,906
Traffic Railing Barrier	703.0	FT	$35	$24,605
Expansion Joints[3]	86.2	FT	$84	$7,238
18 in. thick precast slab	841.3	CY	$750	$630,991
Neoprene Bearing Pads	23.337	CF	$425	$9,918
		Superstructure Subtotal		$676,658
SUBSTRUCTURE:				
Concrete	181.9	CY	$415	$75,492
Reinforcing Steel[2]	26377	LBS	$0.45	$11,869
Pile Hole, Preformed	50	EA	$200	$10,000
Test Piles	84	Ft.	$160	$13,440
18 in. Prestressed Concrete Piles (F & I)	1350	Ft.	$33	$44,550
Pile Splices	5	EA	$110	$550
Drilled shaft	0	LF	$220	
Test load for drilled shaft	0	EA	$50,000	
Core (Shaft Excavation)	0	LF		
Temporary casing	0	LF		
Casing splice	0	EA		
Excavation, unclassified shaft	0	LF		
Drilled shaft sidewall overreaming	0	LF		
Excavation, unclassified extra depth	0	LF		
		Substructure Subtotal		$155,901
		Construction Cost Subtotal		**$832,559**
Mobilization (5% of Construction Cost)	1	LS		$ 41,628
Contingency (15% of Construction Cost)	1	LS		$ 124,884
TOP DOWN Construction (20% of Construction Cost)	1	LS		$ 166,512
		Total Construction Cost		**$1,165,583**
		Deck Square Footage (Ft.)		15,144
		Cost Per Square Foot		**$76.97/sf**

[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

[3]Number of expansion piers: 2

Appendix D-4 Alternatives 2C and 2D

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. ORNARLI
Alternative 2C	ESTIMATE OF ADDITIONAL COST OF STRUCTURES	Checked by: S.YETIMOGLU
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 2Cwetlandside\[Walls.xls]CantWall		November 7, 2000

Project Length 59220.00 Ft
Total Bridge Length 1641.00 Ft (2 - 475ft long, 2 - 345.5ft long bridges)

ITEM	UNIT PRICE	QTY	TOTAL PRICE
Gravity wall on wetland side	$157.30	57579 LF	$9,057,389.96
Retaining wall on wetland side	$159.28	57579 LF	$9,171,099.59
Temporary retaining system	$331.68	57579 LF	$19,097,648.11
Traffic Barrier on retaining wall	$35.00	57579 LF	$2,015,265.00
		* TOTAL:	$39,341,403

*** NOTE: This cost is additional to the cost of 4 bridges in Alternative 2.**

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: S. YETIMOGLU
Alternative 2C	TEMPORARY SHEET PILE COST	Checked by: F. ORNARLI
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 2Cwetlandside\[Walls.xls]CantWall		November 7, 2000

INPUT

Height of Temporary sheet pile	13.00 Ft	(PZ27)
Soil anchor spacing	12.00 Ft	
Spacing of Tie back w/ deadman	12.00 Ft	
Deadman size		
Length	5.00 Ft	
Width	5.00 Ft	
Thickness	0.75 Ft	
Tie rod length	20.00 Ft	
Tie rod size	1.75 in	(No. 14 rebar)
Wale	50.00 lbs/Ft	

ITEM	QTY	35	TOTAL/Ft.
* Temporary sheet pile	13.00 Ft	$16	$208.00
Soil anchor	0.083 each/ft	$1,200	$100.00
Deadman	0.06 CY/ft	$310	$17.94
Tie rod	13 Lbs	$0.45	$5.74
Wale	50 Lbs	$0.80	$40.00
		TOTAL COST/Ft.	**$331.68**

* Unit price used is for permanent sheet pile since sheet piles cannot be removed due to tie rods burried under the new roadway.

DESIGN DATA

Soil Parameters and Loading Information:

Moist Unit Weight of Soil (pcf)	105.00
Saturated Unit Weight of Soil (pcf)	120.00
Coefficient of Friction	0.40
Crane Load Surcharge (psf)	0.00
Angle of internal friction ϕ (deg)	30.00
Wall Friction angle δ (deg)	17.00
Angle of back face of wall α (deg)	90.00
Slope of back fill β (deg)	0.00
Ka	0.299
Equiv. Passive Fluid Pressure (pcf) 35	300.000
Angle of Int. Friction for Key (deg.)	30.000

Soil and Water Elevations (NGVD - feet):

Top of Wall Elevation	13.500
Top of Back Soil Elevation	13.500
Top of Front Soil Elevation	9.500
Back Water Elevation	11.500
Front Water Elevation	10.500
Top of Footing Elevation	8.500

Wall and Footing Information:

Top of Wall Thickness (inch)	11.000
Back Slope of Wall (inch/foot)	0.000
Heel Length (feet)	3.582
Footing Length (feet)	4.500
Footing Thickness (inch)	12.000
Toe Length (feet)	0.001

Wall Design Data:

Dead Load - Load Factor	1.40
L.L. & Soil Pres. - Load Factor	1.70
Concrete Strength (ksi)	4.00
Reinforcing Steel (ksi)	60.00
Cover - Bottom of Footing (inch)	3.00
Cover - Top of Footing (inch)	1.50
Cover - Wall (inch)	2.00

Additional Input

Distance from F.F. Key to Toe	1.000 ft.
Depth of Key	6.0 in.
Rebar Size (wall)	# 8
Rebar Size (Footing - Toe)	# 9
Rebar Size (Footing - Heel)	# 5

ADDITIONAL LOADS

Dead Loads:

Moment (ft-kip/ft)	0.000
Shear (Kips/ft)	0.000
Vertical Load (kips/ft)	0.000

Wind Loads:

Moment (ft-kip/ft)	0.000
Shear (Kips/ft)	0.000
Vertical Load (kips/ft)	0.000

Live Loads:

Moment (ft-kip/ft)	0.000
Shear (Kips/ft)	0.000
Vertical Load (kips/ft)	0.000

Live Load Surcharge(ksf)	0.210
Crane Surcharge load (kips)	0.00
Over Stress Factor	1.00

Note:

1) Live loads, Wind loads and Liveload Surcharge are not considered while designing for Crane Surcharge Loads.
2) The allowable 25% overstress for Wind Loads is not considered in the design to be conservative.
3) Downward loads, loads and moments causing overtruning are positive.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBSJ Done by: F. ORNARLI Checked by: S. YETIMOGLU November 7, 2000
Alternative 2C — CONCRETE CANTILEVER RETAINING WALL	

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Lateral Earth Pressures

Distance from Top of Wall	Back Face Pressures				Front Face Pressures			Net Back Pressures	
	Active Pressure of Soil	Water Adjust.	Surcharge	Total Back Face Pressure	Active Pressure from Soil	Water Pressure	Total Front Face Pressure	Without Surcharge	With Surcharge
feet	psf	psf	psf	psf	psf	psf	psf	psf	psf
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.250	7.860	0.000	0.000	7.860	0.000	0.000	0.000	7.860	7.860
0.500	15.721	0.000	0.000	15.721	0.000	0.000	0.000	15.721	15.721
0.750	23.581	0.000	0.000	23.581	0.000	0.000	0.000	23.581	23.581
1.000	31.441	0.000	0.000	31.441	0.000	0.000	0.000	31.441	31.441
1.250	39.301	0.000	0.000	39.301	0.000	0.000	0.000	39.301	39.301
1.500	47.162	0.000	0.000	47.162	0.000	0.000	0.000	47.162	47.162
1.750	55.022	0.000	0.000	55.022	0.000	0.000	0.000	55.022	55.022
2.000	62.882	0.000	0.000	62.882	0.000	0.000	0.000	62.882	62.882
2.250	70.742	12.052	0.000	82.794	0.000	0.000	0.000	82.794	82.794
2.500	78.603	24.103	0.000	102.706	0.000	0.000	0.000	102.706	102.706
2.750	86.463	36.155	0.000	122.618	0.000	0.000	0.000	122.618	122.618
3.000	94.323	48.207	0.000	142.530	0.000	0.000	0.000	142.530	142.530
3.250	102.183	60.258	0.000	162.442	0.000	15.600	15.600	146.842	146.842
3.500	110.044	72.310	0.000	182.354	0.000	31.200	31.200	151.154	151.154
3.750	117.904	84.362	0.000	202.265	0.000	46.800	46.800	155.465	155.465
4.000	125.764	96.413	0.000	222.177	0.000	62.400	62.400	159.777	159.777
4.250	133.624	108.465	0.000	242.089	0.000	78.000	78.000	164.089	164.089
4.500	141.485	120.517	0.000	262.001	0.000	93.600	93.600	168.401	168.401
4.750	149.345	132.568	0.000	281.913	0.000	109.200	109.200	172.713	172.713
5.000	157.205	144.620	0.000	301.825	0.000	124.800	124.800	177.025	177.025
6.000	188.646	192.826	0.000	381.473	0.000	187.200	187.200	194.273	194.273

WITHOUT CRANE SURCHARGE

Calculation of Driving Moment and Shear

Distance from Top of Wall	Net Back Pressure (no LL or)	Increment Shear	Total Shear	Increment Moment	Total Moment
feet	psf	kips	kips	ft-kips	ft-kips
0.000	62.882	0.000	0.000	0.000	0.000
0.250	70.742	0.017	0.017	0.002	0.002
0.500	78.603	0.019	0.035	0.006	0.009
0.750	86.463	0.021	0.056	0.011	0.020
1.000	94.323	0.023	0.079	0.017	0.037
1.250	102.183	0.025	0.103	0.023	0.059
1.500	110.044	0.027	0.130	0.029	0.088
1.750	117.904	0.028	0.158	0.036	0.124
2.000	125.764	0.030	0.189	0.043	0.168
2.250	145.676	0.034	0.223	0.051	0.219
2.500	165.588	0.039	0.261	0.060	0.279
2.750	185.500	0.044	0.305	0.071	0.350
3.000	205.412	0.049	0.354	0.082	0.432
3.250	209.724	0.052	0.406	0.095	0.528
3.500	214.036	0.053	0.459	0.108	0.636
3.750	218.348	0.054	0.513	0.122	0.757
4.000	222.659	0.055	0.568	0.135	0.892
4.250	226.971	0.056	0.624	0.149	1.041
4.500	231.283	0.057	0.682	0.163	1.205
4.750	235.595	0.058	0.740	0.178	1.382
5.000	239.907	0.059	0.800	0.192	1.575
6.000	257.155	0.249	1.048	0.922	2.497

Driving Moment (ft-kips)
2.497 1.365
(w/ LL & WL) (w/o LL & WL)

Resisting Moment (ft-kips)
7.09 5.049
(w/ LL & (w/o LL & WL)

F.S. against Overturning
2.838 ________

Driving Shear (kips)
1.048 0.671
(w/ LL & (w/o LL & WL)

Bouyant Dead Load Reaction (Kips)
3.174 2.422
(w/ LL & (w/o LL & WL)

Frictional Resistance (kips)
1.270 0.969
(w/ LL & (w/o LL & WL)

F.S. against Sliding
1.211 ________

Depth of Key
6.0 in.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

Alternative 2C **CONCRETE CANTILEVER RETAINING WALL**

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PBSJ
Done by: F. ORNARLI
Checked by: S.YETIMOGLU
November 7, 2000

Calculation of Resisting Moment and Shear

Element	Weight	Mom. Arm	Moment
	kips	feet	ft-kips
Base of Foundation	0.675	2.250	1.519
Constant Thickness Wall	0.688	0.459	0.316
Sloped Backface of Wall	0.000	0.918	0.000
Water over Soil over Toe	0.000	0.001	0.000
Soil over Toe	0.000	0.001	0.000
Soil above Base	1.881	2.709	5.095
Soil above Wall Taper	0.000	0.918	0.000
Water adjust above Base	0.161	2.709	0.437
Water adjust above Wall Taper	0.000	0.918	0.000
Uniform Bouyancy	-0.842	2.250	-1.895
Differential Bouyancy	-0.140	3.000	-0.421
Additional Vertical Load	0.000	0.459	0.000
Additional L.L. Surcharge	0.752	2.709	2.038
Total	3.174		7.087

Bearing against Key (F.S =1.5)
0.605 ksf

Distance from F.F. Key to Toe
1.000 ft.

Depth of Passive Resistance
2.077 feet

Passive Resistance
0.647 kips

S.F. against Sliding
1.829

WITH CRANE SURCHARGE

Calculation of Driving Moment and Shear

Distance from Top of Wall	Net Back Pressure	Increment Shear	Total Shear	Increment Moment	Total Moment
feet	psf	kips	kips	ft-kips	ft-kips
0.000	0.000	0.000	0.000	0.000	0.000
0.250	7.860	0.001	0.001	0.000	0.000
0.500	15.721	0.003	0.004	0.001	0.001
0.750	23.581	0.005	0.009	0.002	0.002
1.000	31.441	0.007	0.016	0.003	0.005
1.250	39.301	0.009	0.025	0.005	0.010
1.500	47.162	0.011	0.035	0.007	0.018
1.750	55.022	0.013	0.048	0.010	0.028
2.000	62.882	0.015	0.063	0.014	0.042
2.250	82.794	0.018	0.081	0.018	0.060
2.500	102.706	0.023	0.104	0.023	0.083
2.750	122.618	0.028	0.132	0.029	0.112
3.000	142.530	0.033	0.166	0.037	0.150
3.250	146.842	0.036	0.202	0.046	0.195
3.500	151.154	0.037	0.239	0.055	0.250
3.750	155.465	0.038	0.277	0.065	0.315
4.000	159.777	0.039	0.317	0.074	0.389
4.250	164.089	0.040	0.357	0.084	0.473
4.500	168.401	0.042	0.399	0.094	0.568
4.750	172.713	0.043	0.441	0.105	0.673
5.000	177.025	0.044	0.485	0.116	0.789
6.000	194.273	0.186	0.671	0.577	1.365

Driving Moment
1.365 ft-kips

Resisting Moment
5.049 ft-kips

F.S. against Overturning
3.698

Driving Shear
0.671 kips

Bouyant Dead Load Reaction
2.422 kips

Frictional Resistance
0.969 kips

F.S. against Sliding
1.444

Depth of Key 6.0 in.

Calculation of Resisting Moment and Shear

Element	Weight	Mom. Arm	Moment
	kips	feet	ft-kips
Base of Foundation	0.675	2.250	1.519
Constant Thickness Wall	0.688	0.459	0.316
Sloped Backface of Wall	0.000	0.918	0.000
Water over Soil over Toe	0.000	0.001	0.000
Soil over Toe	0.000	0.001	0.000
Soil above Base	1.881	2.709	5.095
Soil above Wall Taper	0.000	0.918	0.000
Water adjust above Base	0.161	2.709	0.437
Water adjust above Wall Taper	0.000	0.918	0.000
Uniform Bouyancy	-0.842	2.250	-1.895
Differential Bouyancy	-0.140	3.000	-0.421
Additional Vertical Load	0.000	0.459	0.000
Surcharge	0.000	2.709	0.000
Total w/o Surcharge Vertical Load	2.422		5.049
Total w/ Surcharge Vertical Load	2.422		5.049

Bearing against Key (F.S.=1.5)
0.075 ksf

Distance from F.F. Key to Toe
1.000 ft.

Depth of Passive Resistance
2.077 feet

Passive Resistance
0.647 kips

S.F. against Sliding
2.409

Bearing Capacity Analysis

Service Load Design		Factored Load Design	
Bearing Capacity w/o Surcharge Vertical Load			
Average Bearing Stress (ksf)	0.705	Average Bearing Stress (ksf)	1.293
Section Modulus of Footing (ft^3)	3.375	Section Modulus of Footing (ft^3)	3.375
Eccentricity (feet)	0.804	Eccentricity (feet)	0.717
Bearing Stress Due to Moment (ksf)	0.756	Bearing Stress Due to Moment (ksf)	1.237
Net Length of Bearing (feet)	4.338	Length of Bearing (feet)	4.500
Net Bearing Stress at Toe (ksf)	1.463	Bearing Stress at Toe (ksf)	2.530
Net Bearing Stress at Heel (ksf)	0.000	Bearing Stress at Heel (ksf)	0.056
Bearing Capacity w/ Surcharge Vertical Load			
Average Bearing Stress (ksf)	0.538	Average Bearing Stress (ksf)	1.059
Section Modulus of Footing (ft^3)	3.375	Section Modulus of Footing (ft^3)	3.375
Eccentricity (feet)	0.729	Eccentricity (feet)	0.573
Bearing Stress Due to Moment (ksf)	0.523	Bearing Stress Due to Moment (ksf)	0.810
Net Length of Bearing (feet)	4.500	Length of Bearing (feet)	4.500
Net Bearing Stress at Toe (ksf)	1.061	Bearing Stress at Toe (ksf)	1.869
Net Bearing Stress at Heel (ksf)	0.015	Bearing Stress at Heel (ksf)	0.249

Foundation Design (Factored)

Toe Design Pressures (ksf):		Heel Design Pressures (ksf):	
Bearing Pressures w/o Surcharge Vertical Load			
Downward Pressure Toe End	0.291	Downward Pressure Heel End	1.008
Downward Pressure Wall End	0.291	Downward Pressure Wall End	1.008
Upward Pressure Toe End	-2.530	Upward Pressure Heel End	-0.056
Upward Pressure Wall End	-2.529	Upward Pressure Wall End	-2.026
Bearing Pressures w/ Surcharge Vertical Load			
Downward Pressure Toe End	0.291	Downward Pressure Heel End	1.008
Downward Pressure Wall End	0.291	Downward Pressure Wall End	1.008
Upward Pressure Toe End	-1.869	Upward Pressure Heel End	-0.249
Upward Pressure Wall End	-1.869	Upward Pressure Wall End	-1.539
Foundation Reinforcement:			
Main Toe Reinforcing	# 9	Main Heel Reinforcing	# 5
Effective Depth (inches)	8.438	Effective Depth (inches)	10.188
Shear in Toe (kips)	0.002	Shear in Heel (kips)	0.408
Shear Stress (ksi)	0.000	Shear Stress (ksi)	0.003
Moment in Toe (ft-kips) (Reduced)	0.000	Moment in Heel (ft-kips) (Redu.)	2.110
As-required [Bottom] (in^2/ft)	0.000	As-required [Top] (in^2/ft)	0.046
As-max (in^2/ft)	2.165	As-max (in^2/ft)	2.614
As-min (in^2/ft)	0.338	As-min (in^2/ft)	0.408

WITHOUT CRANE SURCHARGE

Wall Reinforcing Requirements - Shear Check (Factored)

Max. Rebar Size # 8 Allowable Factored Shear Stress 0.108 ksi

Distance from Top of Wall	Effective Depth of Rebar	Net D.L. Back Pressure	Net L.L. Back Pressure	Increment Shear	Total Shear	Shear Stress	Status
feet	inches	psf	psf	kips	kips	ksi	
0.000	8.500	0.000	62.882	0.000	0.000	0.000	O.K.
0.250	8.500	7.860	62.882	0.028	0.028	0.000	O.K.
0.500	8.500	15.721	62.882	0.032	0.060	0.001	O.K.
0.750	8.500	23.581	62.882	0.035	0.095	0.001	O.K.
1.000	8.500	31.441	62.882	0.038	0.134	0.001	O.K.
1.250	8.500	39.301	62.882	0.042	0.175	0.002	O.K.
1.500	8.500	47.162	62.882	0.045	0.220	0.002	O.K.
1.750	8.500	55.022	62.882	0.048	0.269	0.003	O.K.
2.000	8.500	62.882	62.882	0.052	0.321	0.003	O.K.
2.250	8.500	82.794	62.882	0.058	0.378	0.004	O.K.
2.500	8.500	102.706	62.882	0.066	0.445	0.004	O.K.
2.750	8.500	122.618	62.882	0.075	0.519	0.005	O.K.
3.000	8.500	142.530	62.882	0.083	0.602	0.006	O.K.
3.250	8.500	146.842	62.882	0.088	0.690	0.007	O.K.
3.500	8.500	151.154	62.882	0.090	0.780	0.008	O.K.
3.750	8.500	155.465	62.882	0.092	0.872	0.009	O.K.
4.000	8.500	159.777	62.882	0.094	0.966	0.009	O.K.
4.250	8.500	164.089	62.882	0.096	1.062	0.010	O.K.
4.500	8.500	168.401	62.882	0.097	1.159	0.011	O.K.
4.750	8.500	172.713	62.882	0.099	1.258	0.012	O.K.
5.000	8.500	177.025	62.882	0.101	1.359	0.013	O.K.
6.000	N/A	194.273	62.882	0.423	1.782	N/A	N/A

WITH CRANE SURCHARGE

Wall Reinforcing Requirements - Shear Check (Factored)

Max. Rebar Size # 8 Allowable Factored Shear Stress 0.108 ksi

Distance from Top of Wall	Effective Depth of Rebar	Net D.L. Back Pressure	Net L.L. Back Pressure	Increment Shear	Total Shear	Shear Stress	Status
feet	inches	psf	psf	kips	kips	ksi	
0.000	8.500	0.000	0.000	0.000	0.000	0.000	O.K.
0.250	8.500	7.860	0.000	0.002	0.002	0.000	O.K.
0.500	8.500	15.721	0.000	0.005	0.007	0.000	O.K.
0.750	8.500	23.581	0.000	0.008	0.015	0.000	O.K.
1.000	8.500	31.441	0.000	0.012	0.027	0.000	O.K.
1.250	8.500	39.301	0.000	0.015	0.042	0.000	O.K.
1.500	8.500	47.162	0.000	0.018	0.060	0.001	O.K.
1.750	8.500	55.022	0.000	0.022	0.082	0.001	O.K.
2.000	8.500	62.882	0.000	0.025	0.107	0.001	O.K.
2.250	8.500	82.794	0.000	0.031	0.138	0.001	O.K.
2.500	8.500	102.706	0.000	0.039	0.177	0.002	O.K.
2.750	8.500	122.618	0.000	0.048	0.225	0.002	O.K.
3.000	8.500	142.530	0.000	0.056	0.281	0.003	O.K.
3.250	8.500	146.842	0.000	0.061	0.343	0.003	O.K.
3.500	8.500	151.154	0.000	0.063	0.406	0.004	O.K.
3.750	8.500	155.465	0.000	0.065	0.471	0.005	O.K.
4.000	8.500	159.777	0.000	0.067	0.538	0.005	O.K.
4.250	8.500	164.089	0.000	0.069	0.607	0.006	O.K.
4.500	8.500	168.401	0.000	0.071	0.678	0.007	O.K.
4.750	8.500	172.713	0.000	0.072	0.750	0.007	O.K.
5.000	8.500	177.025	0.000	0.074	0.825	0.008	O.K.
6.000	N/A	194.273	0.000	0.316	1.140	N/A	N/A

WITHOUT CRANE SURCHARGE

Wall Reinforcing Requirements - Moment Check (Factored)

Distance from Top of Wall	Effective Depth of Rebar	Net D.L. Back Pressure	Net L.L. Back Pressure	Total Shear	Total Moment	Area of Steel Required	As-max.	As-min.
feet	inches	psf	psf	kips	ft-kips	in^2/ft	in^2/ft	in^2/ft
0.000	8.500	0.000	62.882	0.000	0.000	0.000	2.181	0.340
0.250	8.500	7.860	62.882	0.028	0.003	0.000	2.181	0.340
0.500	8.500	15.721	62.882	0.060	0.014	0.000	2.181	0.340
0.750	8.500	23.581	62.882	0.095	0.034	0.001	2.181	0.340
1.000	8.500	31.441	62.882	0.134	0.062	0.002	2.181	0.340
1.250	8.500	39.301	62.882	0.175	0.101	0.003	2.181	0.340
1.500	8.500	47.162	62.882	0.220	0.150	0.004	2.181	0.340
1.750	8.500	55.022	62.882	0.269	0.211	0.006	2.181	0.340
2.000	8.500	62.882	62.882	0.321	0.285	0.007	2.181	0.340
2.250	8.500	82.794	62.882	0.378	0.372	0.010	2.181	0.340
2.500	8.500	102.706	62.882	0.445	0.475	0.012	2.181	0.340
2.750	8.500	122.618	62.882	0.519	0.595	0.016	2.181	0.340
3.000	8.500	142.530	62.882	0.602	0.735	0.019	2.181	0.340
3.250	8.500	146.842	62.882	0.690	0.897	0.023	2.181	0.340
3.500	8.500	151.154	62.882	0.780	1.081	0.028	2.181	0.340
3.750	8.500	155.465	62.882	0.872	1.287	0.034	2.181	0.340
4.000	8.500	159.777	62.882	0.966	1.517	0.040	2.181	0.340
4.250	8.500	164.089	62.882	1.062	1.770	0.046	2.181	0.340
4.500	8.500	168.401	62.882	1.159	2.048	0.054	2.181	0.340
4.750	8.500	172.713	62.882	1.258	2.350	0.062	2.181	0.340
5.000	8.500	177.025	62.882	1.359	2.677	0.070	2.181	0.340
6.000	N/A	194.273	62.882	1.782	4.245	N/A	N/A	N/A

WITH CRANE SURCHARGE

Wall Reinforcing Requirements - Moment Check (Factored)

Distance from Top of Wall	Effective Depth of Rebar	Net D.L. Back Pressure	Net L.L. Back Pressure	Total Shear	Total Moment	Area of Steel Required (redu.)	As-max.	As-min.
feet	inches	psf	psf	kips	ft-kips	in^2/ft	in^2/ft	in^2/ft
0.000	8.500	0.000	0.000	0.000	0.000	0.000	2.181	0.340
0.250	8.500	7.860	0.000	0.002	0.000	0.000	2.181	0.340
0.500	8.500	15.721	0.000	0.007	0.001	0.000	2.181	0.340
0.750	8.500	23.581	0.000	0.015	0.004	0.000	2.181	0.340
1.000	8.500	31.441	0.000	0.027	0.009	0.000	2.181	0.340
1.250	8.500	39.301	0.000	0.042	0.017	0.000	2.181	0.340
1.500	8.500	47.162	0.000	0.060	0.030	0.001	2.181	0.340
1.750	8.500	55.022	0.000	0.082	0.048	0.001	2.181	0.340
2.000	8.500	62.882	0.000	0.107	0.071	0.002	2.181	0.340
2.250	8.500	82.794	0.000	0.138	0.102	0.003	2.181	0.340
2.500	8.500	102.706	0.000	0.177	0.141	0.004	2.181	0.340
2.750	8.500	122.618	0.000	0.225	0.191	0.005	2.181	0.340
3.000	8.500	142.530	0.000	0.281	0.254	0.007	2.181	0.340
3.250	8.500	146.842	0.000	0.343	0.332	0.009	2.181	0.340
3.500	8.500	151.154	0.000	0.406	0.426	0.011	2.181	0.340
3.750	8.500	155.465	0.000	0.471	0.536	0.014	2.181	0.340
4.000	8.500	159.777	0.000	0.538	0.662	0.017	2.181	0.340
4.250	8.500	164.089	0.000	0.607	0.805	0.021	2.181	0.340
4.500	8.500	168.401	0.000	0.678	0.966	0.025	2.181	0.340
4.750	8.500	172.713	0.000	0.750	1.144	0.030	2.181	0.340
5.000	8.500	177.025	0.000	0.825	1.341	0.035	2.181	0.340
6.000	N/A	194.273	0.000	1.140	2.321	N/A	N/A	N/A

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. ORNARLI
Alternative 2C	CONCRETE CANTILEVER RETAINING WALL	Checked by: S.YETIMOGLU
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RESULTS

Wall height: **5.0 feet**

Footing Reinforcement (Factored load design)

Toe			**Heel**		
As Max.	2.165	in^2/ft	As Max.	2.614	in^2/ft
As Min.	0.338	in^2/ft	As Min.	0.408	in^2/ft
As Reqd.	**0.000**	**in^2/ft**	As Reqd.	**0.046**	**in^2/ft**

WITHOUT CRANE SURCHARGE			**WITH CRANE SURCHARGE**		
Wall Reinf.(Factored load design)			**Wall Reinf.(Factored load design)**		
As Max.	2.181	in^2/ft	As Max.	2.181	in^2/ft
As Min.	0.340	in^2/ft	As Min.	0.340	in^2/ft
As Reqd.	**0.070**	**in^2/ft**	As Reqd.	**0.035**	**in^2/ft**
Bearing Capacity (Service Load)			**Bearing Capacity (Service Load)**		
Net Length of Bearing (feet)	4.338		Net Length of Bearing (feet)	4.500	
Net Bearing Stress at Toe (ksf)	1.463		Net Bearing Stress at Toe (ksf)	1.061	
Net Bearing Stress at Heel (ksf)	0.000		Net Bearing Stress at Heel (ksf)	0.015	
Factor of Safety			**Factor of Safety**		
Overturning	2.838		Overturning	3.698	
Sliding	1.211		Sliding	1.444	
Sliding with key	1.829		Sliding with key	2.409	

Shear

Bot. of Wall (w/o crane surcharge)	0.013
Bot. of Wall (w/ crane surcharge)	0.008
Footing (at Toe)	0.000

QUANTITIES & UNIT COST

	Quantity	Unit price	Cost	
Concrete =	0.35 CY	415	147.30	
Reinforcement =	26.62 lbs	0.45	11.98	
		TOTAL:	**159.28**	$/LF

75 lbs/cy is used

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: S. YETIMOGLU
Alternative 2D	**TEMPORARY SHEET PILE COST**	Checked by: F. ORNARLI
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INPUT

Height of Temporary sheet pile	13.00 Ft	(PZ27)
Soil anchor spacing	12.00 Ft	
Spacing of Tie back w/ deadman	12.00 Ft	
Deadman size		
Length	5.00 Ft	
Width	5.00 Ft	
Thickness	0.75 Ft	
Tie rod length	20.00 Ft	
Tie rod size	1.75 in (No. 14 rebar)	
Wale	50.00 lbs/Ft	

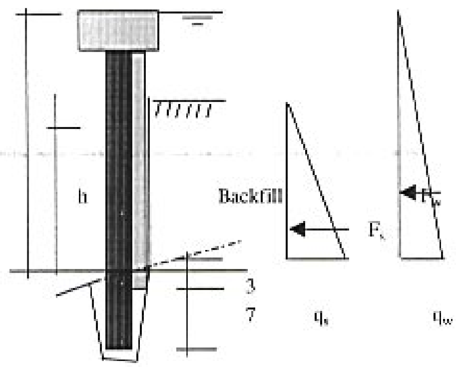
ITEM	QTY	$$	TOTAL/Ft.
* Temporary sheet pile	13.00 Ft	$16	$208.00
Soil anchor	0.083 each/ft	$1,200	$100.00
Deadman	0.06 CY/ft	$310	$17.94
Tie rod	13 Lbs	$0.45	$5.74
Wale	50 Lbs	$0.80	$40.00
		TOTAL COST/Ft.	**$331.68**

* Unit price used is for permanent sheet pile since sheet piles cannot be removed due to tie rods burried under the new roadway.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. ORNARLI
Alternatives 2D	BULKHEAD (KINGPILE WITH TIE-BACK SYSTEM) DESIGN & COST	Checked by: S.YETIMOGLU
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 2Dcanalside\[Walls.xls]CantWall		November 7, 2000

INPUT

Height to Cap-top, H	15.50 Ft
Height to Top of Backfill, h	15.00 Ft
Location of anchor from top	2.50 Ft
Soil Properties:	
Soil Density, γ=	120 Lbs/Cu.Ft.
Angle of Friction, Φ=	30 ^{0}
Coef. Of Active Pressure, Ka=	0.33
Cap Size:	
Height	3.50 Ft
Width	3.00 Ft
Pile Size:	
Diameter	18.00 In.
Penetration	10.00 Ft
Length	24.50 Ft
Spacing	10.00 Ft



OUTPUT	PRESSURE	FORCE	LOCATION FROM BOTTOM	FORCE ON ANCHOR	MAX. MOMENT IN PILE		Mom.Capacity of 18" Sq. Pile(fc'=6 Ksi and 12-0.5 In^2 Strands(*)
Due to Soil	6000.00 Psf.	45.00 K	5.00 Ft	15.00 k	63.40 Ft-K		
Due to Hydrostatic	9920.00 Psf.	76.88 K	5.17 Ft	26.48 k	111.92 Ft-K		
TOTAL		**121.88 K**		**41.48 k**	**175.32 Ft-K**	<	**190.00 Ft-K**

*) See attached document, (PCI Journal, Oct. 1968) for Moment Capacity of Prestressed Pile

ITEM	QTY	U.PRICE	TOTAL/Ft.
Bulkhead Cap	0.389 CY	$415	$161.39
Precast Panels	0.417 CY	$310	$129.17
Reinforcement(*)	81 Lbs	$0.45	$36.25
18" Prestressed Pile/LF	2.45 Ft	$33	$80.85
** 40 ft. long anchor rod	31 Lbs	$0.45	$13.77
** Wale	50 Lbs	$0.80	$40.00
		TOTAL COST/Ft.	**$461.43**

* 100 Lbs/CY

** Sheet pile for MOT will be utilized as Deadman. Therefore, the cost of deadman is not included.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. ORNARLI
Alternative 2D	BULKHEAD (KINGPILE WITH TIE-BACK SYSTEM) DESIGN & COST	Checked by: S.YETIMOGLU
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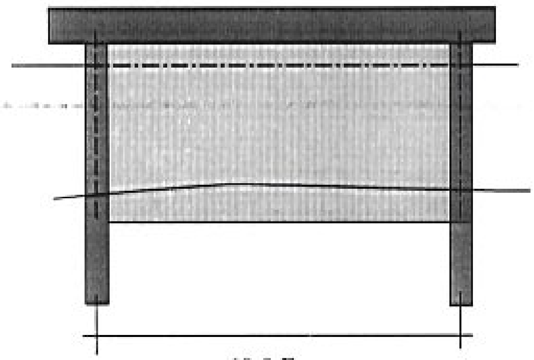
Panel Penetration	3.00 Ft	
Panel Height	15.00 Ft	
Panel Width	10.00 Ft	
Panel Thickness	0.75 Ft	
Max. Soil Pressure	600.00 Psf.	
Max. Hydrostatic Pressure	992.00 Psf.	
Total Pressure	1592.00 Psf.	3 Ft. above the bottom
Max. Pos. Moment	19.90 Ft-K	



PC PANEL DESIGN

Applied Factored Moment	Mu =	27.9 K-Ft/Ft.
Concrete Width	b =	12.0 in
Effective Depth	d =	6.70 in
Total Depth	h =	9.0 in
28-Day Conc. Comp. Stress	f'c =	3.4 ksi
Rebar Yield Stress	fy =	60.0 ksi
1.2 x Cracking Moment	1.2Mcr=	7.1 k-ft
	β1=	0.85
	As(min) =	**0.24 in^2 (1.2Mcr)**
	As(4/3) =	**1.43 in^2 (1/3 > required)**
	As (reqd) =	**1.07 in^2**
	As(max) =	**1.46 in^2**

DESIGN DATA

Soil Parameters and Loading Information:

Moist Unit Weight of Soil (pcf)	105.00
Saturated Unit Weight of Soil (pcf)	120.00
Coefficient of Friction	0.40
Crane Load Surcharge (psf)	0.00
Angle of internal friction φ (deg)	30.00
Wall Friction angle δ (deg)	17.00
Angle of back face of wall α (deg)	90.00
Slope of back fill β (deg)	0.00
Ka	0.299
Equiv. Passive Fluid Pressure (pcf)	300.000
Angle of Int. Friction for Key (deg.)	30.000

Soil and Water Elevations (NGVD - feet):

Top of Wall Elevation	13.500
Top of Back Soil Elevation	13.500
Top of Front Soil Elevation	9.500
Back Water Elevation	11.500
Front Water Elevation	10.500
Top of Footing Elevation	8.500

Wall and Footing Information:

Top of Wall Thickness (inch)	11.000
Back Slope of Wall (inch/foot)	0.000
Heel Length (feet)	3.582
Footing Length (feet)	4.500
Footing Thickness (inch)	12.000
Toe Length (feet)	0.001

Wall Design Data:

Dead Load - Load Factor	1.40
L.L. & Soil Pres. - Load Factor	1.70
Concrete Strength (ksi)	4.00
Reinforcing Steel (ksi)	60.00
Cover - Bottom of Footing (inch)	3.00
Cover - Top of Footing (inch)	1.50
Cover - Wall (inch)	2.00

Additional Input

Distance from F.F. Key to Toe	1.000 ft.
Depth of Key	6.0 in.
Rebar Size (wall)	# 8
Rebar Size (Footing - Toe)	# 9
Rebar Size (Footing - Heel)	# 5

ADDITIONAL LOADS

Dead Loads:

Moment (ft-kip/ft)	0.000
Shear (Kips/ft)	0.000
Vertical Load (kips/ft)	0.000

Wind Loads:

Moment (ft-kip/ft)	0.000
Shear (Kips/ft)	0.000
Vertical Load (kips/ft)	0.000

Live Loads:

Moment (ft-kip/ft)	0.000
Shear (Kips/ft)	0.000
Vertical Load (kips/ft)	0.000

Live Load Surcharge(ksf)	0.210
Crane Surcharge load (kips)	0.00
Over Stress Factor	1.00

Note:

1) Live loads, Wind loads and Liveload Surcharge are not considered while designing for Crane Surcharge Loads.
2) The allowable 25% overstress for Wind Loads is not considered in the design to be conservative.
3) Downward loads, loads and moments causing overtruning are positive.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBSJ Done by: F. ORNARLI Checked by: S. YETIMOGLU November 7, 2000
Alternative 2D — CONCRETE CANTILEVER RETAINING WALL	

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Lateral Earth Pressures

Distance from Top of Wall	Back Face Pressures				Front Face Pressures			Net Back Pressures	
	Active Pressure of Soil	Water Adjust.	Surcharge	Total Back Face Pressure	Active Pressure from Soil	Water Pressure	Total Front Face Pressure	Without Surcharge	With Surcharge
feet	psf	psf	psf	psf	psf	psf	psf	psf	psf
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.250	7.860	0.000	0.000	7.860	0.000	0.000	0.000	7.860	7.860
0.500	15.721	0.000	0.000	15.721	0.000	0.000	0.000	15.721	15.721
0.750	23.581	0.000	0.000	23.581	0.000	0.000	0.000	23.581	23.581
1.000	31.441	0.000	0.000	31.441	0.000	0.000	0.000	31.441	31.441
1.250	39.301	0.000	0.000	39.301	0.000	0.000	0.000	39.301	39.301
1.500	47.162	0.000	0.000	47.162	0.000	0.000	0.000	47.162	47.162
1.750	55.022	0.000	0.000	55.022	0.000	0.000	0.000	55.022	55.022
2.000	62.882	0.000	0.000	62.882	0.000	0.000	0.000	62.882	62.882
2.250	70.742	12.052	0.000	82.794	0.000	0.000	0.000	82.794	82.794
2.500	78.603	24.103	0.000	102.706	0.000	0.000	0.000	102.706	102.706
2.750	86.463	36.155	0.000	122.618	0.000	0.000	0.000	122.618	122.618
3.000	94.323	48.207	0.000	142.530	0.000	0.000	0.000	142.530	142.530
3.250	102.183	60.258	0.000	162.442	0.000	15.600	15.600	146.842	146.842
3.500	110.044	72.310	0.000	182.354	0.000	31.200	31.200	151.154	151.154
3.750	117.904	84.362	0.000	202.265	0.000	46.800	46.800	155.465	155.465
4.000	125.764	96.413	0.000	222.177	0.000	62.400	62.400	159.777	159.777
4.250	133.624	108.465	0.000	242.089	0.000	78.000	78.000	164.089	164.089
4.500	141.485	120.517	0.000	262.001	0.000	93.600	93.600	168.401	168.401
4.750	149.345	132.568	0.000	281.913	0.000	109.200	109.200	172.713	172.713
5.000	157.205	144.620	0.000	301.825	0.000	124.800	124.800	177.025	177.025
6.000	188.646	192.826	0.000	381.473	0.000	187.200	187.200	194.273	194.273

WITHOUT CRANE SURCHARGE

Calculation of Driving Moment and Shear

Distance from Top of Wall	Net Back Pressure	Increment Shear	Total Shear	Increment Moment	Total Moment
feet	psf	kips	kips	ft-kips	ft-kips
0.000	62.882	0.000	0.000	0.000	0.000
0.250	70.742	0.017	0.017	0.002	0.002
0.500	78.603	0.019	0.035	0.006	0.009
0.750	86.463	0.021	0.056	0.011	0.020
1.000	94.323	0.023	0.079	0.017	0.037
1.250	102.183	0.025	0.103	0.023	0.059
1.500	110.044	0.027	0.130	0.029	0.088
1.750	117.904	0.028	0.158	0.036	0.124
2.000	125.764	0.030	0.189	0.043	0.168
2.250	145.676	0.034	0.223	0.051	0.219
2.500	165.588	0.039	0.261	0.060	0.279
2.750	185.500	0.044	0.305	0.071	0.350
3.000	205.412	0.049	0.354	0.082	0.432
3.250	209.724	0.052	0.406	0.095	0.528
3.500	214.036	0.053	0.459	0.108	0.636
3.750	218.348	0.054	0.513	0.122	0.757
4.000	222.659	0.055	0.568	0.135	0.892
4.250	226.971	0.056	0.624	0.149	1.041
4.500	231.283	0.057	0.682	0.163	1.205
4.750	235.595	0.058	0.740	0.178	1.382
5.000	239.907	0.059	0.800	0.192	1.575
6.000	257.155	0.249	1.048	0.922	2.497

Driving Moment (ft-kips)
2.497 1.365
(w/ LL & WL) (w/o LL & WL)
Resisting Moment (ft-kips)
7.09 5.049
(w/ LL & (w/o LL & WL)
F.S. against Overturning
2.838

Driving Shear (kips)
1.048 0.671
(w/ LL & (w/o LL & WL)
Bouyant Dead Load Reaction (Kips)
3.174 2.422
(w/ LL & (w/o LL & WL)
Frictional Resistance (kips)
1.270 0.969
(w/ LL & (w/o LL & WL)
F.S. against Sliding
1.211

Depth of Key
6.0 in.

Calculation of Resisting Moment and Shear

Element	Weight	Mom. Arm	Moment
	kips	feet	ft-kips
Base of Foundation	0.675	2.250	1.519
Constant Thickness Wall	0.688	0.459	0.316
Sloped Backface of Wall	0.000	0.918	0.000
Water over Soil over Toe	0.000	0.001	0.000
Soil over Toe	0.000	0.001	0.000
Soil above Base	1.881	2.709	5.095
Soil above Wall Taper	0.000	0.918	0.000
Water adjust above Base	0.161	2.709	0.437
Water adjust above Wall Taper	0.000	0.918	0.000
Uniform Bouyancy	-0.842	2.250	-1.895
Differential Bouyancy	-0.140	3.000	-0.421
Additional Vertical Load	0.000	0.459	0.000
Additional L.L. Surcharge	0.752	2.709	2.038
Total	3.174		7.087

Bearing against Key (F.S.=1.5)
0.605 ksf

Distance from F.F. Key to Toe
1.000 ft.

Depth of Passive Resistance
2.077 feet

Passive Resistance
0.647 kips

S.F. against Sliding
1.829

WITH CRANE SURCHARGE

Calculation of Driving Moment and Shear

Distance from Top of Wall	Net Back Pressure	Increment Shear	Total Shear	Increment Moment	Total Moment
feet	psf	kips	kips	ft-kips	ft-kips
0.000	0.000	0.000	0.000	0.000	0.000
0.250	7.860	0.001	0.001	0.000	0.000
0.500	15.721	0.003	0.004	0.001	0.001
0.750	23.581	0.005	0.009	0.002	0.002
1.000	31.441	0.007	0.016	0.003	0.005
1.250	39.301	0.009	0.025	0.005	0.010
1.500	47.162	0.011	0.035	0.007	0.018
1.750	55.022	0.013	0.048	0.010	0.028
2.000	62.882	0.015	0.063	0.014	0.042
2.250	82.794	0.018	0.081	0.018	0.060
2.500	102.706	0.023	0.104	0.023	0.083
2.750	122.618	0.028	0.132	0.029	0.112
3.000	142.530	0.033	0.166	0.037	0.150
3.250	146.842	0.036	0.202	0.046	0.195
3.500	151.154	0.037	0.239	0.055	0.250
3.750	155.465	0.038	0.277	0.065	0.315
4.000	159.777	0.039	0.317	0.074	0.389
4.250	164.089	0.040	0.357	0.084	0.473
4.500	168.401	0.042	0.399	0.094	0.568
4.750	172.713	0.043	0.441	0.105	0.673
5.000	177.025	0.044	0.485	0.116	0.789
6.000	194.273	0.186	0.671	0.577	1.365

Driving Moment
1.365 ft-kips

Resisting Moment
5.049 ft-kips

F.S. against Overturning
3.698

Driving Shear
0.671 kips

Bouyant Dead Load Reaction
2.422 kips

Frictional Resistance
0.969 kips

F.S. against Sliding
1.444

Depth of Key 6.0 in.

Calculation of Resisting Moment and Shear

Element	Weight	Mom. Arm	Moment
	kips	feet	ft-kips
Base of Foundation	0.675	2.250	1.519
Constant Thickness Wall	0.688	0.459	0.316
Sloped Backface of Wall	0.000	0.918	0.000
Water over Soil over Toe	0.000	0.001	0.000
Soil over Toe	0.000	0.001	0.000
Soil above Base	1.881	2.709	5.095
Soil above Wall Taper	0.000	0.918	0.000
Water adjust above Base	0.161	2.709	0.437
Water adjust above Wall Taper	0.000	0.918	0.000
Uniform Bouyancy	-0.842	2.250	-1.895
Differential Bouyancy	-0.140	3.000	-0.421
Additional Vertical Load	0.000	0.459	0.000
Surcharge	0.000	2.709	0.000
Total w/o Surcharge Vertical Load	2.422		5.049
Total w/ Surcharge Vertical Load	2.422		5.049

Bearing against Key (F.S.=1.5)
0.075 ksf

Distance from F.F. Key to Toe
1.000 ft.

Depth of Passive Resistance
2.077 feet

Passive Resistance
0.647 kips

S.F. against Sliding
2.409

Bearing Capacity Analysis

Service Load Design		Factored Load Design	
Bearing Capacity w/o Surcharge Vertical Load			
Average Bearing Stress (ksf)	0.705	Average Bearing Stress (ksf)	1.293
Section Modulus of Footing (ft^3)	3.375	Section Modulus of Footing (ft^3)	3.375
Eccentricity (feet)	0.804	Eccentricity (feet)	0.717
Bearing Stress Due to Moment (ksf)	0.756	Bearing Stress Due to Moment (ksf)	1.237
Net Length of Bearing (feet)	4.338	Length of Bearing (feet)	4.500
Net Bearing Stress at Toe (ksf)	1.463	Bearing Stress at Toe (ksf)	2.530
Net Bearing Stress at Heel (ksf)	0.000	Bearing Stress at Heel (ksf)	0.056
Bearing Capacity w/ Surcharge Vertical Load			
Average Bearing Stress (ksf)	0.538	Average Bearing Stress (ksf)	1.059
Section Modulus of Footing (ft^3)	3.375	Section Modulus of Footing (ft^3)	3.375
Eccentricity (feet)	0.729	Eccentricity (feet)	0.573
Bearing Stress Due to Moment (ksf)	0.523	Bearing Stress Due to Moment (ksf)	0.810
Net Length of Bearing (feet)	4.500	Length of Bearing (feet)	4.500
Net Bearing Stress at Toe (ksf)	1.061	Bearing Stress at Toe (ksf)	1.869
Net Bearing Stress at Heel (ksf)	0.015	Bearing Stress at Heel (ksf)	0.249

Foundation Design (Factored)

Toe Design Pressures (ksf):		Heel Design Pressures (ksf):	
Bearing Pressures w/o Surcharge Vertical Load			
Downward Pressure Toe End	0.291	Downward Pressure Heel End	1.008
Downward Pressure Wall End	0.291	Downward Pressure Wall End	1.008
Upward Pressure Toe End	-2.530	Upward Pressure Heel End	-0.056
Upward Pressure Wall End	-2.529	Upward Pressure Wall End	-2.026
Bearing Pressures w/ Surcharge Vertical Load			
Downward Pressure Toe End	0.291	Downward Pressure Heel End	1.008
Downward Pressure Wall End	0.291	Downward Pressure Wall End	1.008
Upward Pressure Toe End	-1.869	Upward Pressure Heel End	-0.249
Upward Pressure Wall End	-1.869	Upward Pressure Wall End	-1.539
Foundation Reinforcement:			
Main Toe Reinforcing	# 9	Main Heel Reinforcing	# 5
Effective Depth (inches)	8.438	Effective Depth (inches)	10.188
Shear in Toe (kips)	0.002	Shear in Heel (kips)	0.408
Shear Stress (ksi)	0.000	Shear Stress (ksi)	0.003
Moment in Toe (ft-kips) (Reduced)	0.000	Moment in Heel (ft-kips) (Redu.)	2.110
As-required [Bottom] (in^2/ft)	0.000	As-required [Top] (in^2/ft)	0.046
As-max (in^2/ft)	2.165	As-max (in^2/ft)	2.614
As-min (in^2/ft)	0.338	As-min (in^2/ft)	0.408

WITHOUT CRANE SURCHARGE

Wall Reinforcing Requirements - Shear Check (Factored)

Max. Rebar Size # 8 Allowable Factored Shear Stress 0.108 ksi

Distance from Top of Wall	Effective Depth of Rebar	Net D.L. Back Pressure	Net L.L. Back Pressure	Increment Shear	Total Shear	Shear Stress	Status
feet	inches	psf	psf	kips	kips	ksi	
0.000	8.500	0.000	62.882	0.000	0.000	0.000	O.K.
0.250	8.500	7.860	62.882	0.028	0.028	0.000	O.K.
0.500	8.500	15.721	62.882	0.032	0.060	0.001	O.K.
0.750	8.500	23.581	62.882	0.035	0.095	0.001	O.K.
1.000	8.500	31.441	62.882	0.038	0.134	0.001	O.K.
1.250	8.500	39.301	62.882	0.042	0.175	0.002	O.K.
1.500	8.500	47.162	62.882	0.045	0.220	0.002	O.K.
1.750	8.500	55.022	62.882	0.048	0.269	0.003	O.K.
2.000	8.500	62.882	62.882	0.052	0.321	0.003	O.K.
2.250	8.500	82.794	62.882	0.058	0.378	0.004	O.K.
2.500	8.500	102.706	62.882	0.066	0.445	0.004	O.K.
2.750	8.500	122.618	62.882	0.075	0.519	0.005	O.K.
3.000	8.500	142.530	62.882	0.083	0.602	0.006	O.K.
3.250	8.500	146.842	62.882	0.088	0.690	0.007	O.K.
3.500	8.500	151.154	62.882	0.090	0.780	0.008	O.K.
3.750	8.500	155.465	62.882	0.092	0.872	0.009	O.K.
4.000	8.500	159.777	62.882	0.094	0.966	0.009	O.K.
4.250	8.500	164.089	62.882	0.096	1.062	0.010	O.K.
4.500	8.500	168.401	62.882	0.097	1.159	0.011	O.K.
4.750	8.500	172.713	62.882	0.099	1.258	0.012	O.K.
5.000	8.500	177.025	62.882	0.101	1.359	0.013	O.K.
6.000	N/A	194.273	62.882	0.423	1.782	N/A	N/A

WITH CRANE SURCHARGE

Wall Reinforcing Requirements - Shear Check (Factored)

Max. Rebar Size # 8 Allowable Factored Shear Stress 0.108 ksi

Distance from Top of Wall	Effective Depth of Rebar	Net D.L. Back Pressure	Net L.L. Back Pressure	Increment Shear	Total Shear	Shear Stress	Status
feet	inches	psf	psf	kips	kips	ksi	
0.000	8.500	0.000	0.000	0.000	0.000	0.000	O.K.
0.250	8.500	7.860	0.000	0.002	0.002	0.000	O.K.
0.500	8.500	15.721	0.000	0.005	0.007	0.000	O.K.
0.750	8.500	23.581	0.000	0.008	0.015	0.000	O.K.
1.000	8.500	31.441	0.000	0.012	0.027	0.000	O.K.
1.250	8.500	39.301	0.000	0.015	0.042	0.000	O.K.
1.500	8.500	47.162	0.000	0.018	0.060	0.001	O.K.
1.750	8.500	55.022	0.000	0.022	0.082	0.001	O.K.
2.000	8.500	62.882	0.000	0.025	0.107	0.001	O.K.
2.250	8.500	82.794	0.000	0.031	0.138	0.001	O.K.
2.500	8.500	102.706	0.000	0.039	0.177	0.002	O.K.
2.750	8.500	122.618	0.000	0.048	0.225	0.002	O.K.
3.000	8.500	142.530	0.000	0.056	0.281	0.003	O.K.
3.250	8.500	146.842	0.000	0.061	0.343	0.003	O.K.
3.500	8.500	151.154	0.000	0.063	0.406	0.004	O.K.
3.750	8.500	155.465	0.000	0.065	0.471	0.005	O.K.
4.000	8.500	159.777	0.000	0.067	0.538	0.005	O.K.
4.250	8.500	164.089	0.000	0.069	0.607	0.006	O.K.
4.500	8.500	168.401	0.000	0.071	0.678	0.007	O.K.
4.750	8.500	172.713	0.000	0.072	0.750	0.007	O.K.
5.000	8.500	177.025	0.000	0.074	0.825	0.008	O.K.
6.000	N/A	194.273	0.000	0.316	1.140	N/A	N/A

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

Alternative 2D **CONCRETE CANTILEVER RETAINING WALL**

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Done by: F. ORNARLI
Checked by: S.YETIMOGLU
November 7, 2000

WITHOUT CRANE SURCHARGE

Wall Reinforcing Requirements - Moment Check (Factored)

Distance from Top of Wall	Effective Depth of Rebar	Net D.L. Back Pressure	Net L.L. Back Pressure	Total Shear	Total Moment	Area of Steel Required	As-max.	As-min.
feet	inches	psf	psf	kips	ft-kips	in^2/ft	in^2/ft	in^2/ft
0.000	8.500	0.000	62.882	0.000	0.000	0.000	2.181	0.340
0.250	8.500	7.860	62.882	0.028	0.003	0.000	2.181	0.340
0.500	8.500	15.721	62.882	0.060	0.014	0.000	2.181	0.340
0.750	8.500	23.581	62.882	0.095	0.034	0.001	2.181	0.340
1.000	8.500	31.441	62.882	0.134	0.062	0.002	2.181	0.340
1.250	8.500	39.301	62.882	0.175	0.101	0.003	2.181	0.340
1.500	8.500	47.162	62.882	0.220	0.150	0.004	2.181	0.340
1.750	8.500	55.022	62.882	0.269	0.211	0.006	2.181	0.340
2.000	8.500	62.882	62.882	0.321	0.285	0.007	2.181	0.340
2.250	8.500	82.794	62.882	0.378	0.372	0.010	2.181	0.340
2.500	8.500	102.706	62.882	0.445	0.475	0.012	2.181	0.340
2.750	8.500	122.618	62.882	0.519	0.595	0.016	2.181	0.340
3.000	8.500	142.530	62.882	0.602	0.735	0.019	2.181	0.340
3.250	8.500	146.842	62.882	0.690	0.897	0.023	2.181	0.340
3.500	8.500	151.154	62.882	0.780	1.081	0.028	2.181	0.340
3.750	8.500	155.465	62.882	0.872	1.287	0.034	2.181	0.340
4.000	8.500	159.777	62.882	0.966	1.517	0.040	2.181	0.340
4.250	8.500	164.089	62.882	1.062	1.770	0.046	2.181	0.340
4.500	8.500	168.401	62.882	1.159	2.048	0.054	2.181	0.340
4.750	8.500	172.713	62.882	1.258	2.350	0.062	2.181	0.340
5.000	8.500	177.025	62.882	1.359	2.677	0.070	2.181	0.340
6.000	N/A	194.273	62.882	1.782	4.245	N/A	N/A	N/A

WITH CRANE SURCHARGE

Wall Reinforcing Requirements - Moment Check (Factored)

Distance from Top of Wall	Effective Depth of Rebar	Net D.L. Back Pressure	Net L.L. Back Pressure	Total Shear	Total Moment	Area of Steel Required (redu.)	As-max.	As-min.
feet	inches	psf	psf	kips	ft-kips	in^2/ft	in^2/ft	in^2/ft
0.000	8.500	0.000	0.000	0.000	0.000	0.000	2.181	0.340
0.250	8.500	7.860	0.000	0.002	0.000	0.000	2.181	0.340
0.500	8.500	15.721	0.000	0.007	0.001	0.000	2.181	0.340
0.750	8.500	23.581	0.000	0.015	0.004	0.000	2.181	0.340
1.000	8.500	31.441	0.000	0.027	0.009	0.000	2.181	0.340
1.250	8.500	39.301	0.000	0.042	0.017	0.000	2.181	0.340
1.500	8.500	47.162	0.000	0.060	0.030	0.001	2.181	0.340
1.750	8.500	55.022	0.000	0.082	0.048	0.001	2.181	0.340
2.000	8.500	62.882	0.000	0.107	0.071	0.002	2.181	0.340
2.250	8.500	82.794	0.000	0.138	0.102	0.003	2.181	0.340
2.500	8.500	102.706	0.000	0.177	0.141	0.004	2.181	0.340
2.750	8.500	122.618	0.000	0.225	0.191	0.005	2.181	0.340
3.000	8.500	142.530	0.000	0.281	0.254	0.007	2.181	0.340
3.250	8.500	146.842	0.000	0.343	0.332	0.009	2.181	0.340
3.500	8.500	151.154	0.000	0.406	0.426	0.011	2.181	0.340
3.750	8.500	155.465	0.000	0.471	0.536	0.014	2.181	0.340
4.000	8.500	159.777	0.000	0.538	0.662	0.017	2.181	0.340
4.250	8.500	164.089	0.000	0.607	0.805	0.021	2.181	0.340
4.500	8.500	168.401	0.000	0.678	0.966	0.025	2.181	0.340
4.750	8.500	172.713	0.000	0.750	1.144	0.030	2.181	0.340
5.000	8.500	177.025	0.000	0.825	1.341	0.035	2.181	0.340
6.000	N/A	194.273	0.000	1.140	2.321	N/A	N/A	N/A

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. ORNARLI Checked by: S. YETIMOGLU November 7, 2000
Alternative 2D	CONCRETE CANTILEVER RETAINING WALL	
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 2Dcanalside\[Walls.xls]CantWall		

RESULTS

Wall height: **5.0 feet**

Footing Reinforcement (Factored load design)

	Toe			Heel	
As Max.	2.165	in^2/ft	As Max.	2.614	in^2/ft
As Min.	0.338	in^2/ft	As Min.	0.408	in^2/ft
As Reqd.	**0.000**	**in^2/ft**	As Reqd.	**0.046**	**in^2/ft**

WITHOUT CRANE SURCHARGE			WITH CRANE SURCHARGE		
Wall Reinf.(Factored load design)			**Wall Reinf.(Factored load design)**		
As Max.	2.181	in^2/ft	As Max.	2.181	in^2/ft
As Min.	0.340	in^2/ft	As Min.	0.340	in^2/ft
As Reqd.	**0.070**	**in^2/ft**	As Reqd.	**0.035**	**in^2/ft**
Bearing Capacity (Service Load)			**Bearing Capacity (Service Load)**		
Net Length of Bearing (feet)	4.338		Net Length of Bearing (feet)	4.500	
Net Bearing Stress at Toe (ksf)	1.463		Net Bearing Stress at Toe (ksf)	1.061	
Net Bearing Stress at Heel (ksf)	0.000		Net Bearing Stress at Heel (ksf)	0.015	
Factor of Safety			**Factor of Safety**		
Overturning	2.838		Overturning	3.698	
Sliding	1.211		Sliding	1.444	
Sliding with key	1.829		Sliding with key	2.409	

Shear

Bot. of Wall (w/o crane surcharge)	0.013
Bot. of Wall (w/ crane surcharge)	0.008
Footing (at Toe)	0.000

QUANTITIES & UNIT COST

	Quantity	Unit price	Cost	
Concrete =	0.35 CY	415	147.30	
Reinforcement =	26.62 lbs	0.45	11.98	
		TOTAL:	**159.28**	$/LF

75 lbs/cy is used

Appendix D-5 Alternative 3

PBSJ

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

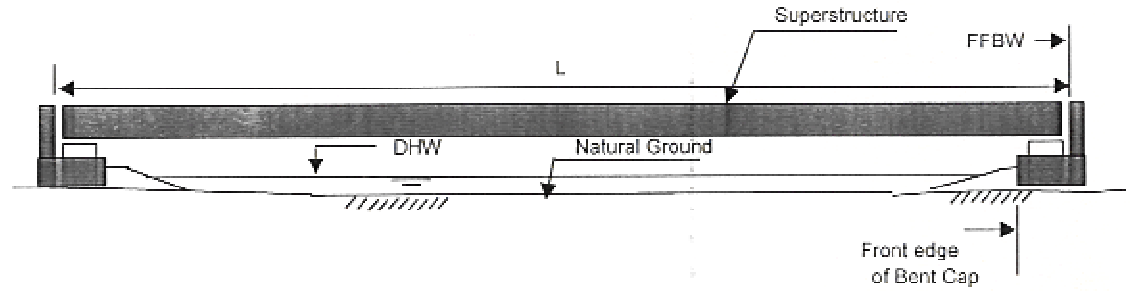
BRIDGE AND SPAN LENGTHS

Sheet ____ of ____

Design: FO Date: 11/29/00
Checked: CL Date: 11/29/00

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type C Bridge 1 and 8 xls]COST

Alternative 3 (Bridges 1 & 8)



Bridge Length L: **1214** Ft.
Minimum Span length 75 Ft.
Increaments of number of spans 1

NO. OF	ADJUSTED BRIDGE LENGTH(FT.)			ADJUSTED SPAN LENGTH (FT.)		
SPANS	18 PILE	24 PILE	36 DRILLED SHAFT	18 PILE	24 PILE	36 DRILLED SHAFT
9	1214	1214	1214	134.9	134.9	134.9
10	1214	1214	1214	121.4	121.4	121.4
11	1214	1214	1214	110.4	110.4	110.4
12	1214	1214	1214	101.2	101.2	101.2
13	1214	1214	1214	93.4	93.4	93.4
14	1214	1214	1214	86.7	86.7	86.7
15	1214	1214	1214	80.9	80.9	80.9
16	1214	1214	1214	75.9	75.9	75.9

BEAM SPACING VS DESIGN SPAN

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Alternative 3 (Bridges 1 & 8)

BRIDGE WIDTH: 43.083 Ft. SLAB THICK: 8.5 In.

NUMBER OF BEAMS	* BEAM SPACING	** DESIGN SPAN (AASHTO BEAMS)			
		TYPE V	TYPE VI	FBT72	FBT78
4	10.77	108.5	126.0	114.0	118.0
5	8.62	115.5	135.0	124.0	128.0
6	7.18	120.5	141.0	132.0	138.0
7	6.15	125.0	146.0	137.0	145.0
8	5.39	128.0	150.0	143.0	152.0

* Based on Cantilever being half of the beam spacing.

** Design spans are determined from the charts based on the beam spacing given.

PBS&J

Tamiami Trail Modified Water Deliveries to Everglades National Park Project

Preparation of Engineering Appendix For GRR / SEIS
Corp of Engineers, Jacksonville, Florida

AASHTO BEAMS COMPARISON

Sheet ____ of ____

Design: FO Date: 07/11/00
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Alternative 3 (Bridges 1 & 8)

NUMBER OF SPANS	ADJUSTED SPAN LENGTH (FT.) PILES 18 IN.	24 IN.	DRILLED SHAFT	NUMBER OF AASHTO BEAMS 18" PILES V	VI	FBT72	FBT78	24" PILES V	VI	FBT72	FBT78	DRILLED SHAFT V	VI	FBT72	FBT78
9	134.9	134.9	134.9		5	7	6		5	7	6		5	7	6
10	121.4	121.4	121.4	7	4	5	5	7	4	5	5	7	4	5	5
11	110.4	110.4	110.4	5	4	4	4	5	4	4	4	5	4	4	4
12	101.2	101.2	101.2	4	4	4	4	4	4	4	4	4	4	4	4
13	93.4	93.4	93.4	4	4	4	4	4	4	4	4	4	4	4	4
14	86.7	86.7	86.7	4	4	4	4	4	4	4	4	4	4	4	4
15	80.9	80.9	80.9	4	4	4	4	4	4	4	4	4	4	4	4
16	75.9	75.9	75.9	4	4	4	4	4	4	4	4	4	4	4	4

NUMBER OF SPANS	ESTIMATED CONSTRUCTION COST OF AASHTO BEAMS 18" PILES V	VI	FBT72	FBT78	24" PILES V	VI	FBT72	FBT78	DRILLED SHAFT V	VI	FBT72	FBT78
9	N/A	$667,700	$824,306	801240	N/A	$667,700	$824,306	801240	N/A	$667,700	$824,306	801240
10	$781,816	$534,160	$588,790	667700	$781,816	$534,160	$588,790	667700	$781,816	$534,160	$588,790	667700
11	$558,440	$534,160	$471,032	534160	$558,440	$534,160	$471,032	534160	$558,440	$534,160	$471,032	534160
12	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160
13	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160
14	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160
15	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160
16	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160	$446,752	$534,160	$471,032	534160
Beam Unit Price:	$92.00	$110.00	$97.00	110.00	$92.00	$110.00	$97.00	110.00	$92.00	$110.00	$97.00	110.00

NUMBER OF SPANS	MOST ECONOMICAL AASHTO BEAM TYPE 18" PILES TYPE	COST	24" PILES TYPE	COST	DRILLED SHAFT TYPE	COST
9	VI	$667,700	VI	$667,700	VI	$667,700
10	VI	$534,160	VI	$534,160	VI	$534,160
11	FBT72	$471,032	FBT72	$471,032	FBT72	$471,032
12	V	$446,752	V	$446,752	V	$446,752
13	V	$446,752	V	$446,752	V	$446,752
14	V	$446,752	V	$446,752	V	$446,752
15	V	$446,752	V	$446,752	V	$446,752
16	V	$446,752	V	$446,752	V	$446,752

PBSJ

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

SUPERSTRUCTURE ALTERNATIVES COMPARISION

Sheet ______ of ______
Design: FO Date: 11/29/00
Checked: CL Date: 11/29/00

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Alternative 3 (Bridges 1 & 8)

SPAN NUMBER	ADJUSTED SPAN LENGTH (FT.)			COST OF BEAMS & DECK SLAB						BEAM NUMBERS		
	FOR 18" PILES	FOR 24" PILES	FOR DRILLED SHAFT	FOR 18" PILES		FOR 24" PILES		FOR DRILLED SHAFT		18 IN. PILES	24 IN. PILES	DRILLED SHAFT
				TYPE	COST	TYPE	COST	TYPE	COST			
9	134.9	134.9	134.9	VI	$1,219,643	VI	$1,219,643	VI	$1,219,643	5	5	5
10	121.4	121.4	121.4	VI	$1,086,103	VI	$1,086,103	VI	$1,086,103	4	4	4
11	110.4	110.4	110.4	FBT72	$1,022,975	FBT72	$1,022,975	FBT72	$1,022,975	4	4	4
12	101.2	101.2	101.2	V	$998,695	V	$998,695	V	$998,695	4	4	4
13	93.4	93.4	93.4	V	$998,695	V	$998,695	V	$998,695	4	4	4
14	86.7	86.7	86.7	V	$998,695	V	$998,695	V	$998,695	4	4	4
15	80.9	80.9	80.9	V	$998,695	V	$998,695	V	$998,695	4	4	4
16	75.9	75.9	75.9	V	$998,695	V	$998,695	V	$998,695	4	4	4

Deck Reinforcement 205 Lbs/CY of Concrete
Cost of Deck/Feet $455

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	FOUNDATION LOADS AND NUMBER OF 18 IN. PRESTRESSED PILES	Design: SY Date: 11/29/00 Checked: CL Date: 11/29/00

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Alternative 3 (Bridges 1 & 8)

Bridge Width (ft)	43.083							
Number of lanes	3							
Beam Type	VI	VI	FBT72	V	V	V	V	V
Beam Weight (k/ft)	1.130	1.130	0.800	1.055	1.055	1.055	1.055	1.055
Number of Spans	9	10	11	12	13	14	15	16
Number of Beams	5	4	4	4	4	4	4	4
Span Length (ft)	131.9	121.4	110.4	101.2	93.4	86.7	80.9	75.9
Beam Span (ft)	132.9	119.4	108.4	99.2	91.4	84.7	78.9	73.9
Bridge Deck Thickness (in)	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Comp. Loads (ksf)	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Barrier Loads (k/ft)(both sides)	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Dead Load								
Beam Load (kips) (END BENT)	800.1	651.5	519.5	527.8	487.2	452.4	422.2	395.8
Beam Load (kips) (PIER)	1600.3	1303.1	1038.9	1055.5	974.3	904.7	844.4	791.6
Live Load								
Reduction factor	0.9							
Impact factor for Substructure	1.0							
LL Reaction per lane (END BENT)								
Truck load (kips)	67.02	66.46	65.91	65.36	64.80	64.25	63.70	63.14
Lane load (kips)	69.16	64.85	61.32	58.37	55.88	53.75	51.90	50.28
Total Live Load (kips) (END BENT)	186.7	179.5	178.0	176.5	175.0	173.5	172.0	170.5
LL Reaction per lane (PIER)								
Truck load (kips)	67.85	67.39	66.93	66.46	66.00	65.54	65.08	64.62
Lane load (kips)	112.33	103.70	96.63	90.75	85.77	81.50	77.80	74.56
Total Live Load (kips) (PIER)	303.3	280.0	260.9	245.0	231.6	220.0	210.1	201.3
Total Load								
Superstructure Load (kips) (END BENT)	1080.6	924.7	791.1	797.9	755.8	719.6	687.9	660.0
Superstructure Load (kips) (PIER)	1961.7	1641.2	1358.0	1358.7	1264.1	1182.9	1112.6	1051.1
Foundation								
Maximum pile spacing (ft)	13.0							
Service Load Capacity of Piles (kips)	147.0							
** Number of Piles Reqd For END BENT	8.0	7.0	6.0	6.0	6.0	5.0	5.0	5.0
** Number of Piles Reqd For PIER	N/A	N/A	N/A	N/A	9.0	9.0	8.0	8.0
Service Design Load (kips)(END BENT)	135	132	132	133	126	144	138	132
Service Design Load (kips)(PIER)	N/A	N/A	N/A	N/A	140	131	139	131

** NOTE: N/A indicates that required number of piles exceeds the max. number of piles based on minimum pile spacing (3 * pile size)

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	FOUNDATION LOADS AND NUMBER OF 24 IN. PRESTRESSED PILES	Design: SY Date: 11/29/00 Checked: CL Date: 11/29/00

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Alternative 3 (Bridges 1 & 8)

Bridge Width (ft)	43.083							
Number of lanes	3							
Beam Type	VI	VI	FBT72	V	V	V	V	V
Beam Weight (k/ft)	1.130	1.130	0.800	1.055	1.055	1.055	1.055	1.055
Number of Spans	9	10	11	12	13	14	15	16
Number of Beams	5	4	4	4	4	4	4	4
Span Length (ft)	134.9	121.4	110.4	101.2	93.4	86.7	80.9	75.9
Beam Span (ft)	132.9	119.4	108.4	99.2	91.4	84.7	78.9	73.9
Bridge Deck Thickness (in)	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Comp. Loads (ksf)	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Barrier Loads (k/ft)(both sides)	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Dead Load								
Beam Load (kips) (END BENT)	800.1	651.5	519.5	527.8	487.2	452.4	422.2	395.8
Beam Load (kips) (PIER)	1600.3	1303.1	1038.9	1055.5	974.3	904.7	844.4	791.6
Live Load								
Reduction factor	0.9							
Impact factor for Substructure	1.0							
LL Reaction per lane (END BENT)								
Truck load (kips)	67.02	66.46	65.91	65.36	64.80	64.25	63.70	63.14
Lane load (kips)	69.16	64.85	61.32	58.37	55.88	53.75	51.90	50.28
Total Live Load (kips) (END BENT)	186.7	179.5	178.0	176.5	175.0	173.5	172.0	170.5
LL Reaction per lane (PIER)								
Truck load (kips)	67.85	67.39	66.93	66.46	66.00	65.54	65.08	64.62
Lane load (kips)	112.33	103.70	96.63	90.75	85.77	81.50	77.80	74.56
Total Live Load (kips) (PIER)	303.3	280.0	260.9	245.0	231.6	220.0	210.1	201.3
Total Load								
Superstructure Load (kips) (END BENT)	1080.6	924.7	791.1	797.9	755.8	719.6	687.9	660.0
Superstructure Load (kips) (PIER)	1961.7	1641.2	1358.0	1358.7	1264.1	1182.9	1112.6	1051.1
Foundation								
Maximum pile spacing (ft)	13.0							
Service Load Capacity of Piles (kips)	260.0							
** Number of Piles Reqd For END BENT	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
** Number of Piles Reqd For PIER	N/A	7.0	6.0	6.0	5.0	5.0	5.0	5.0
Service Design Load (kips)(END BENT)	216	231	198	199	189	180	172	165
Service Design Load (kips)(PIER)	N/A	234	226	226	253	237	223	210

** NOTE: N/A indicates that required number of piles exceeds the max. number of piles based on minimum pile spacing (3 * pile size).

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	FOUNDATION LOADS ON DRILLED SHAFT	Design: SY Date: 11/29/00 Checked: CL Date: 11/29/00

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Alternative 3 (Bridges 1 & 8)

Bridge Width (ft)	43.083							
Number of lanes	3							
Beam Type	VI	VI	FBT72	V	V	V	V	V
Beam Weight (k/ft)	1.130	1.130	0.800	1.055	1.055	1.055	1.055	1.055
Number of Spans	9	10	11	12	13	14	15	16
Number of Beams	5	4	4	4	4	4	4	4
Span Length (ft)	134.9	121.4	110.4	101.2	93.4	86.7	80.9	75.9
Beam Span (ft)	132.9	119.4	108.4	99.2	91.4	84.7	78.9	73.9
Bridge Deck Thickness (in)	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Comp. Loads (ksf)	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Barrier Loads (k/ft)(both sides)	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Dead Load								
Beam Load (kips) (END BENT)	800.1	651.5	519.5	527.8	487.2	452.4	422.2	395.8
Beam Load (kips) (PIER)	1600.3	1303.1	1038.9	1055.5	974.3	904.7	844.4	791.6
Live Load								
Reduction factor	0.9							
Impact factor for Substructure	1.0							
LL Reaction per lane (END BENT)								
Truck load (kips)	67.02	66.46	65.91	65.36	64.80	64.25	63.70	63.14
Lane load (kips)	69.16	64.85	61.32	58.37	55.88	53.75	51.90	50.28
Total Live Load (kips) (END BENT)	186.7	179.5	178.0	176.5	175.0	173.5	172.0	170.5
LL Reaction per lane (PIER)								
Truck load (kips)	67.85	67.39	66.93	66.46	66.00	65.54	65.08	64.62
Lane load (kips)	112.33	103.70	96.63	90.75	85.77	81.50	77.80	74.56
Total Live Load (kips) (PIER)	303.3	280.0	260.9	245.0	231.6	220.0	210.1	201.3
Total Load								
* Superstructure Load (kips) (END BENT)	1109.7	953.8	820.2	827.0	784.9	748.6	717.0	689.1
* Superstructure Load (kips) (PIER)	1981.1	1660.6	1377.4	1378.1	1283.5	1202.3	1132.0	1070.5
Foundation								
Maximum pile spacing (ft)	16.0							
Cantilever dist. from shaft to coping (ft)	6.0							
Number of Piles Required For END BENT	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Number of Piles Required For PIER	2	2	2	2	2	2	2	2
Service Design Load (kips)(END BENT)	370	318	273	276	262	250	239	230
Service Design Load (kips)(PIER)	991	830	689	689	642	601	566	535

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Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

INTERMEDIATE BENTS / PIERS

Sheet ______ of ______
Design: FO Date: 11/29/00
Checked: CL Date: 11/29/00

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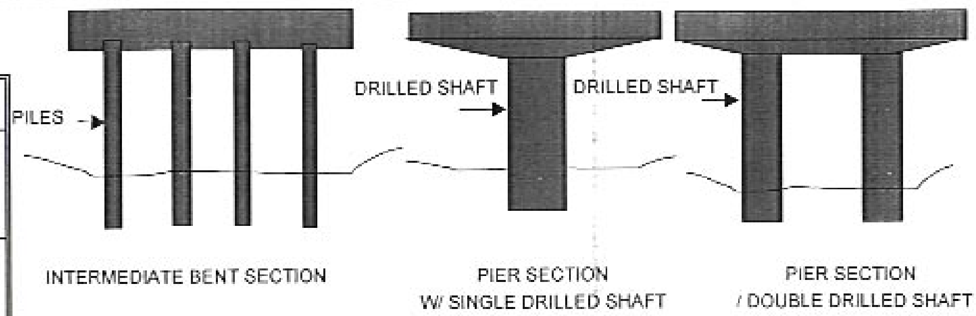
Alternative 3 (Bridges 1 & 8)

Pile Dia.(Inches)	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
Estimated Pile Embedment Length(Ft.)	19	19	21
Pile Length Above Ground(Ft.)	8	8	8
Total Length of Pile (Ft.)	27	27	29
Estimated Cost of One Pile/Drilled Shaft	$891	$1,242	$6,380
BentCap X-section (SqFt.)	9	9	12
Bent Length(Ft.)	43.083	43.083	43.083
Total Concrete Volume(CY.)	14.36	14.36	19.15
Reinforcement(Lbs) *	2082	2082	2776
ESTIMATED COST OF BENT CAP	$6,897	$6,897	$9,196



* 145 Lbs/CY

PRESTRESSED PILES	18 IN. PILES	24 IN. PILES
No. of test piles with dynamic load tests per bridge	7	7
Estimated total cost of test piles w/ dynamic load test per bridge	$47,040.00	$47,040.00
% of pile splice	10	10
% of pile hole preformed	100	100

DRILLED SHAFT		
No of test load for drilled shaft per bridge	EA	1
Core(Shaft Excavation)	LF	0
Length of temporary casing	LF	0
% of casing splice	%	0
Excavation, unclassified shaft	LF	
Drilled shaft sidewall overreaming	LF	0
Excavation, unclassified extra depth	LF	0

NUMBER OF SPANS	NUMBER OF PILES		NUMBER OF	TOTAL COST OF PILES PER BENT		TOTAL COST OF DRILLED SHAFT	ESTIMATED COST OF ONE BENT/PIER		
	18 IN. PILES	24 IN. PILES	DRILLED SHAFT	18 IN. PILES	24 IN. PILES	PER PIER	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
9	N/A	N/A	2	N/A	N/A	$19,010	N/A	N/A	$28,206
10	N/A	7	2	N/A	$15,440	$18,316	N/A	$22,337	$27,511
11	N/A	6	2	N/A	$13,458	$17,760	N/A	$20,355	$26,956
12	N/A	6	2	N/A	$13,030	$17,305	N/A	$19,927	$26,501
13	9	5	2	$13,838	$11,215	$16,927	$20,735	$18,112	$26,122
14	9	5	2	$13,536	$10,913	$16,606	$20,433	$17,810	$25,802
15	8	5	2	$12,176	$10,655	$16,331	$19,073	$17,552	$25,527
16	8	5	2	$11,952	$10,431	$16,093	$18,849	$17,328	$25,289

PBSJ	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet		of	2
	END BENTS	Design:	FO	Date:	11/29/00
		Checked:	CL	Date:	11/29/00

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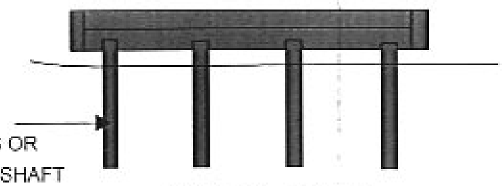
Alternative 3 (Bridges 1 & 8)

Pile Dia.(Inches)	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
Estimated Pile Embedment Length(Ft.)	19	19	21
Pile Length Above Ground(Ft.)	8	8	8
Total Length of Pile (Ft.)	27	27	29
Estimated Cost of One Pile/Drilled Shaft	$891	$1,242	$6,380
End BentCap X-section (SqFt.)	7.5	7.5	12
End Bent Length(Ft.)	43.083	43.083	43.083
Total Concrete Volume(CY.)	11.97	11.97	19.15
Reinforcement(Lbs) *	1735	1735	2776
ESTIMATED COST OF BENT CAP	$5,747	$5,747	$9,196



* 145 Lbs/CY

	PRESTRESSED PILES		DRILLED SHAFTS		
	18 IN. PILES	24 IN. PILES	Core(Shaft Excavation)	LF	0
			Length of temporary casing	LF	0
			%'age of casing splice	%	0
			Excavation, unclassified shaft	LF	
% of pile splice	10	10	Drilled shaft sidewall overreaming	LF	0
% Pile hole preformed	100	100	Excavation, unclassified extra depth	LF	

NUMBER OF SPANS	* NUMBER OF PILES		** NUMBER OF	TOTAL COST OF PILES PER ENDBENT		TOTAL COST OF DRILLED SHAFT PER	ESTIMATED COST OF ONE ENDBENT		
	18 IN. PILES	24 IN. PILES	DRILLED SHAFT	18 IN. PILES	24 IN. PILES	ENDBENT **	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
9	10	5	5	$11,020	$7,295	$31,900	$33,593	$29,868	$57,921
10	9	4	5	$9,918	$5,836	$31,900	$32,491	$28,409	$57,921
11	8	4	5	$8,816	$5,836	$31,900	$31,389	$28,409	$57,921
12	8	4	5	$8,816	$5,836	$31,900	$28,791	$25,811	$55,324
13	8	4	5	$8,816	$5,836	$31,900	$28,791	$25,811	$55,324
14	7	4	5	$7,714	$5,836	$31,900	$27,689	$25,811	$55,324
15	7	4	5	$7,714	$5,836	$31,900	$27,689	$25,811	$55,324
16	7	4	5	$7,714	$5,836	$31,900	$27,689	$25,811	$55,324

* Includes 2 wingwall piles for all beam types

** Includes 2 wingwall drilled shafts for all beam types

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Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

Sheet ______ of ______

SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISION

Design: FO Date: 11/29/00
Checked: CL Date: 11/29/00

Alternative 3 (Bridges 1 & 8)

SPAN NUMBER	ADJUSTED SPAN LENGTH (FT.)			NO. OF PIERS	COST OF SUBSTRUCTURE			COST OF SUPER STRUCTURE			TOTAL COST OF STRUCTURE		
	18 IN. PILES	24 IN. PILES	DRILLED SHAFT		18 IN. PILES	24 IN. PILES	DRILLED SHAFT	18 IN. PILES	24 IN. PILES	DRILLED SHAFT	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
9	134.9	134.9	134.9	8	N/A	N/A	$341,490	$1,219,643	$1,219,643	$1,219,643	N/A	N/A	$1,561,133
10	121.4	121.4	121.4	9	N/A	$257,847	$363,445	$1,086,103	$1,086,103	$1,086,103	N/A	$1,343,950	$1,449,549
11	110.4	110.4	110.4	10	N/A	$260,367	$385,401	$1,022,975	$1,022,975	$1,022,975	N/A	$1,283,342	$1,408,377
12	101.2	101.2	101.2	11	N/A	$270,822	$402,161	$998,695	$998,695	$998,695	N/A	$1,269,517	$1,400,857
13	93.4	93.4	93.4	12	$306,401	$268,965	$424,117	$998,695	$998,695	$998,695	$1,305,096	$1,267,660	$1,422,813
14	86.7	86.7	86.7	13	$321,012	$283,157	$446,073	$998,695	$998,695	$998,695	$1,319,707	$1,281,852	$1,444,768
15	80.9	80.9	80.9	14	$322,398	$297,348	$468,029	$998,695	$998,695	$998,695	$1,321,094	$1,296,044	$1,466,724
16	75.9	75.9	75.9	15	$338,111	$311,540	$489,985	$998,695	$998,695	$998,695	$1,338,807	$1,310,236	$1,488,680

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

COST	FOUNDATION ALTERNATIVE	SUPERSTR. ALTERNATIVE	CORRESPONDING NUMBER OF SPANS	NUMBER OF BEAMS	NUMBER OF PILES OR DRILLED SHAFT	TOTAL LENGTH OF PILES OR DRILLED SHAFT (FT.)	NUMBER OF TEST PILES	TOTAL LENGTH OF TEST PILES (FT.)
$1,561,133	DRILLED SHAFT	VI	9	5	26	754	0	0
$1,449,549	DRILLED SHAFT	VI	10	4	28	812	0	0
$1,408,377	DRILLED SHAFT	FBT72	11	4	30	870	0	0
$1,400,857	DRILLED SHAFT	V	12	4	32	928	0	0
$1,422,813	DRILLED SHAFT	V	13	4	34	986	0	0
$1,444,768	DRILLED SHAFT	V	14	4	36	1044	0	0
$1,466,724	DRILLED SHAFT	V	15	4	38	1102	0	0
$1,488,680	DRILLED SHAFT	V	16	4	40	1160	0	0

$1,400,857 <— Minimum

RESULT OF COST COMPARISON STUDY:

MOST ECONOMICAL SUPERSTRUCTURE TYPE:	V		
MOST ECONOMICAL SUBSTRUCTURE TYPE:	DRILLED SHAFT		
OPTIMUM SPAN ARRANGEMENT	12	SPANS AT	101.17 FT.
TOTAL BRIDGE LENGTH:	1214 FT.		
TOTAL NUMBER OF BEAMS:	48		
TOTAL BEAM LENGTH:	4856 FT.		
NUMBER OF PILES OR DRILLED SHAFT	32		
LENGTH OF PILES OR DRILLED SHAFT:	928 FT.		

NOTE: DRILLED SHAFT ALTERNATIVE IS CHOSEN TO MINIMIZE THE OBSTRUCTION IN CANAL

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Sheet ___ of ___ Design: FO Date: 11/29/00 Checked: CL Date: 11/29/00

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Alternative 3 (Bridges 1 & 8)

ITEM	QUANTITY	UNITS	UNIT PRICE	AMOUNT
SUPERSTRUCTURE:				
Class II Concrete -- (Superstructure)	1372.1	CY	$310.00	$425,364
Reinforcing Steel -- (Superstructure)*	281289	LBS	$0.45	$126,580
Bridge Floor Grooving	5396	SY	$2.50	$13,489
Traffic Railing Barrier	2428.0	FT	$35.00	$84,980
Expansion Joints***	215.4	FT	$84.00	$18,095
AASHTO Beam, Type V	4856.0	FT	$92.00	$446,752
Neoprene Bearing Pads	26.880	CY	$425.00	$11,424
			Superstructure Subtotal	$1,126,683
SUBSTRUCTURE:				
Class II Concrete -- (Substructure)	341.1	CY	$415.00	$141,573
Reinforcing Steel -- (Substructure)**	49465	LBS	$0.45	$22,259
Pile Hole, Preformed	0	EA	$0.00	$0
Test Piles	0	Ft.	$0.00	$0
Prestressed Concrete Piles (F & I)	0	Ft.	$0.00	$0
Pile Splices	0	EA	$0.00	$0
Drilled shaft	986	LF	$220.00	$216,920
Test load for drilled shaft	1	EA	$50,000.00	$50,000
Core(Shaft Excavation)	0	LF	$0.00	$0
Temporary casing	0	LF	$0.00	$0
Casing splice	0	EA	$0.00	$0
Excavation, unclassified shaft	0	LF	$0.00	$0
Drilled shaft sidewall overreaming	0	LF	$0.00	$0
Excavation, unclassified extra depth	0	LF	$0.00	$0
			Substructure Subtotal	$430,752
			Construction Cost Subtotal	**$1,557,435**
Mobilization (5% of Construction Cost)	1	LS		$77,872
Contingency (15% of Construction Cost)	1	LS		$233,615.29
			Total Construction Cost	**$1,868,922**
			Deck Square Footage (Ft.)	52,303
			Cost Per Square Foot	**$35.73**

Note: Extra Pier Concrete, Reinforcement and Drilled Shaft are considered due to straddle piers.

*RATIO REBAR:CONC. (SUPERSTRUCTURE):	205	Lbs/CY.
**RATIO REBAR:CONC. (SUBSTRUCTURE):	145	Lbs/CY.
***NO.OF EXPANSION PIERS:	5	

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridges 2 & 7)	BRIDGE AND SPAN LENGTHS	Checked by: C. Li
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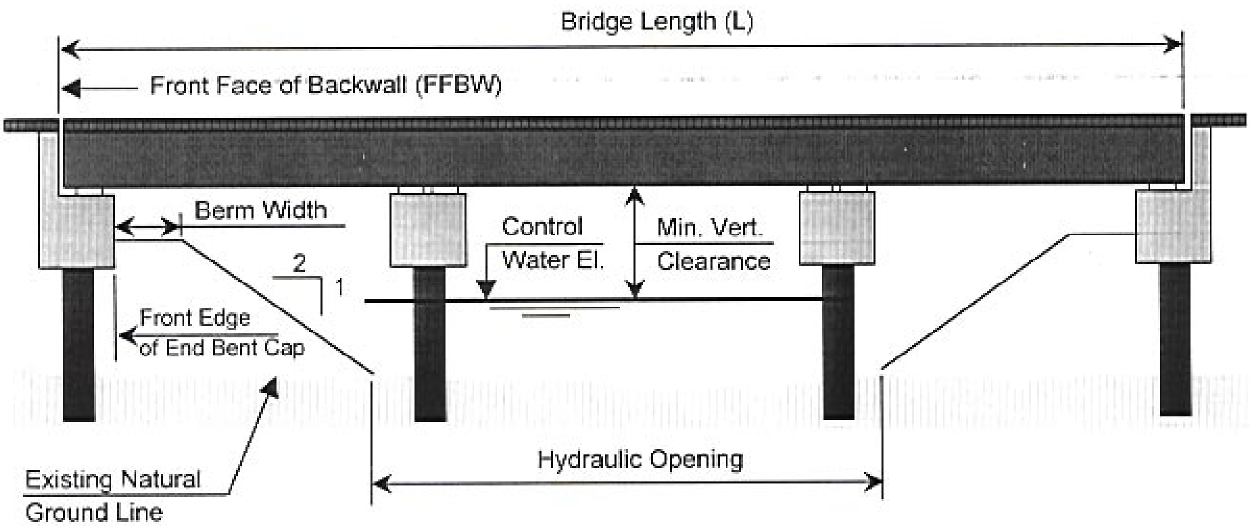
Determine Bridge Length based on hydraulic opening:



Hydraulic Opening Width at Natural Ground Level	200.00 Ft.
Natural Ground Elevation	5.00 Ft.
Control Water Elevation	9.00 Ft.
Minimum Clearance over Control Water Elevation	6.00 Ft.
Berm Width	3.00 Ft.
Vertical Distance from bottom of beams to top of Berm where slope starts	2.25 Ft.
Distance From FFBW to Front Edge of End Bent Cap	2.00 Ft.
Minimum Span length	28.00 Ft.
Preliminary Bridge Length (No adjustment due to pile/drilled shaft in the opening), L' =	**241.00 Ft.**

Number of Spans	ADJUSTED BRIDGE LENGTH (L)			ADJUSTED SPAN LENGTH		
	18 in. Pile	24 in. Pile	36 in. Drilled Shaft	18 in. Pile	24 in. Pile	36 in. Drilled Shaft
3	244.00 Ft.	245.00 Ft.	247.00 Ft.	81.33 Ft.	81.67 Ft.	82.33 Ft.
4	245.50 Ft.	247.00 Ft.	250.00 Ft.	61.38 Ft.	61.75 Ft.	62.50 Ft.
5	247.00 Ft.	249.00 Ft.	253.00 Ft.	49.40 Ft.	49.80 Ft.	50.60 Ft.
6	248.50 Ft.	251.00 Ft.	256.00 Ft.	41.42 Ft.	41.83 Ft.	42.67 Ft.
7	250.00 Ft.	253.00 Ft.	259.00 Ft.	35.71 Ft.	36.14 Ft.	37.00 Ft.
8	251.50 Ft.	255.00 Ft.	262.00 Ft.	31.44 Ft.	31.88 Ft.	32.75 Ft.
9	253.00 Ft.	257.00 Ft.	265.00 Ft.	28.11 Ft.	28.56 Ft.	29.44 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridges 2 & 7)	**BEAM SPACING vs. DESIGN SPAN**	Checked by: C. Li
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Determine beam spacing and design span:

Bridge Width: 43.08 Ft.
Slab Thickness: 8.00 in.

Number of Beams	[1]Beam Spacing	[2]Design Span					
		AASHTO Type II	AASHTO Type III	AASHTO Type IV	18" Double T	24" Double T	30" Double T
4	10.77 Ft.	**46.00 Ft.**	**65.00 Ft.**	**84.00 Ft.**			
5	8.62 Ft.	**52.00 Ft.**	**73.00 Ft.**	**90.00 Ft.**			
6	7.18 Ft.	**58.00 Ft.**	**78.00 Ft.**	**96.00 Ft.**	**40.00 Ft.**	**50.00 Ft.**	**60.00 Ft.**
7	6.15 Ft.	**62.00 Ft.**	**82.00 Ft.**	**98.00 Ft.**			
8	5.39 Ft.	**66.00 Ft.**	**84.00 Ft.**	**102.00 Ft.**			

[1]Beam spacing is based on assuming the cantilever to be half of the beam spacing.

[2]Design spans are determined from the charts based on the beam spacing given.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBS&J Done by: M. LeComte
Alternative 3 (Bridges 2 & 7) — **AASHTO BEAMS COMPARISON**	Checked by: C. Li
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Number of Spans	Adjusted Span Length			Number of AASHTO Beams Required								
	PILES		Drilled Shaft	18" Piles			24" Piles			Drilled Shaft		
	18 in.	24 in.		II	III	IV	II	III	IV	II	III	IV
3	81.33 Ft.	81.67 Ft.	82.33 Ft.		7	4		7	4		8	4
4	61.38 Ft.	61.75 Ft.	62.50 Ft.	7	4	4	7	4	4	8	4	4
5	49.40 Ft.	49.80 Ft.	50.60 Ft.	5	4	4	5	4	4	5	4	4
6	41.42 Ft.	41.83 Ft.	42.67 Ft.	4	4	4	4	4	4	4	4	4
7	35.71 Ft.	36.14 Ft.	37.00 Ft.	4	4	4	4	4	4	4	4	4
8	31.44 Ft.	31.88 Ft.	32.75 Ft.	4	4	4	4	4	4	4	4	4
9	28.11 Ft.	28.56 Ft.	29.44 Ft.	4	4	4	4	4	4	4	4	4

Number of Spans	Estimated Construction Cost of AASHTO Beams								
	18 in. Piles			24 in. Piles			DRILLED SHAFT		
	II	III	IV	II	III	IV	II	III	IV
3	N/A	$114,436	$81,984	N/A	$114,905	$82,320	N/A	$132,392	$82,992
4	$92,799	$65,794	$82,488	$93,366	$66,196	$82,992	$108,000	$67,000	$84,000
5	$66,690	$66,196	$82,992	$67,230	$66,732	$83,664	$68,310	$67,804	$85,008
6	$53,676	$66,598	$83,496	$54,216	$67,268	$84,336	$55,296	$68,608	$86,016
7	$54,000	$67,000	$84,000	$54,648	$67,804	$85,008	$55,944	$69,412	$87,024
8	$54,324	$67,402	$84,504	$55,080	$68,340	$85,680	$56,592	$70,216	$88,032
9	$54,648	$67,804	$85,008	$55,512	$68,876	$86,352	$57,240	$71,020	$89,040

Number of Spans	Most Economical AASHTO Beam Type					
	18" PILES		24" PILES		DRILLED SHAFT	
	TYPE	COST	TYPE	COST	TYPE	COST
3	IV	$81,984	IV	$82,320	IV	$82,992
4	III	$65,794	III	$66,196	III	$67,000
5	III	$66,196	III	$66,732	III	$67,804
6	II	$53,676	II	$54,216	II	$55,296
7	II	$54,000	II	$54,648	II	$55,944
8	II	$54,324	II	$55,080	II	$56,592
9	II	$54,648	II	$55,512	II	$57,240

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridges 2 & 7)	SUPERSTRUCTURE ALTERNATIVES COMPARISON	Checked by: C. Li
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Number	AASHTO BEAMS WITH DECK						Florida Double Tee Beams					
of	18" PILES		24" PILES		DRILLED SHAF		18" PILES		24" PILES		DRILLED SHAF	
Spans	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST
3	IV	$186,394	IV	$187,157	IV	$188,685	N/A		N/A		N/A	
4	III	$170,845	III	$171,889	III	$173,977	N/A		N/A		N/A	
5	III	$171,889	III	$173,281	III	$176,065	FDT24	$318,630	FDT24	$321,210	FDT30	$379,500
6	II	$160,011	II	$161,621	II	$164,840	FDT24	$320,565	FDT24	$323,790	FDT24	$330,240
7	II	$160,977	II	$162,909	II	$166,772	FDT18	$270,000	FDT18	$273,240	FDT18	$279,720
8	II	$161,943	II	$164,197	II	$168,704	FDT18	$271,620	FDT18	$275,400	FDT18	$282,960
9	II	$162,909	II	$165,484	II	$170,636	FDT18	$273,240	FDT18	$277,560	FDT18	$286,200

Deck Reinforcement 205 lbs/CY concrete
Cost of Deck per foot $428/ft.

Number	PRECAST SLAB						MOST ECONOMICAL SUPERSTRUCTURE ALTERNATIVE								
of	18" PILES		24" PILES		DRILLED SHAF		18 in. Pile			24 in. Pile			36 in. Shaft		
Spans	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost
3							4	IV	$186,394	4	IV	$187,157	4	IV	$188,685
4							4	III	$170,845	4	III	$171,889	4	III	$173,977
5							4	III	$171,889	4	III	$173,281	4	III	$176,065
6							4	II	$160,011	4	II	$161,621	4	II	$164,840
7	21	$523,582	22	$555,097	22	$568,261	4	II	$160,977	4	II	$162,909	4	II	$166,772
8	19	$476,560	20	$508,623	20	$522,585	4	II	$161,943	4	II	$164,197	4	II	$168,704
9	18	$454,170	18	$461,351	18	$475,712	4	II	$162,909	4	II	$165,484	4	II	$170,636

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: M. LeCounte
Checked by: C. Li

Alternative 3 (Bridges 2 & 7)

FOUNDATION LOADS and NUMBER of 18 in. PRESTRESSED PILES

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November 29, 2000

Bridge Width 43.08 Ft. | Number of lanes 3 | Number of Florida Double Tee = 6

Number of Spans	3 spans	4 spans	5 spans	6 spans	7 spans	8 spans	9 spans
Beam Type	IV	III	III	II	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	81.33 Ft.	61.38 Ft.	49.40 Ft.	41.42 Ft.	35.71 Ft.	31.44 Ft.	28.11 Ft.
Beam Span (ft)	79.33 Ft.	59.38 Ft.	47.40 Ft.	39.42 Ft.	33.71 Ft.	29.44 Ft.	26.11 Ft.
Bridge Deck Thickness (in)	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load							
Beam Load (End Bent)	399.8 k	272.4 k	219.2 k	167.3 k	144.3 k	127.0 k	113.6 k
Beam Load (Pier)	799.7 k	544.8 k	438.5 k	334.7 k	288.6 k	254.0 k	227.1 k
Live Load							
Reduction factor	0.9						
Impact factor for Substructure	1.0						
LL Reaction per lane (END BENT)							
Truck load	63.7 k	61.1 k	58.4 k	55.8 k	53.2 k	50.6 k	48.1 k
Lane load	52.0 k	45.6 k	41.8 k	39.3 k	37.4 k	36.1 k	35.0 k
Total Live Load (END BENT)	172.1 k	164.8 k	157.7 k	150.6 k	143.6 k	136.7 k	129.9 k
LL Reaction per lane (PIER)							
Truck load	65.1 k	62.9 k	60.7 k	58.5 k	56.3 k	54.2 k	52.1 k
Lane load	78.1 k	65.3 k	57.6 k	52.5 k	48.9 k	46.1 k	44.0 k
Total Live Load (PIER)	210.7 k	176.3 k	163.8 k	157.9 k	152.1 k	146.3 k	140.6 k
Total Load							
Superstructure Load (END BENT)	748.0 k	613.3 k	553.0 k	494.0 k	464.0 k	439.8 k	419.5 k
Superstructure Load (PIER)	1068.6 k	779.2 k	660.4 k	550.7 k	498.8 k	458.5 k	425.9 k
Foundation							
Maximum pile spacing	13.0 Ft.						
Service Load Capacity of Piles	**147.0 k**						
Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.						
Number of Piles Required For END BENT	6	5	4	4	4	4	4
Number of Piles Required For PIER	8	6	5	4	4	4	4
Service Design Load (END BENT)	125 k	123 k	138 k	124 k	116 k	110 k	105 k
Service Design Load (PIER)	134 k	130 k	132 k	138 k	125 k	115 k	106 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
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November 29, 2000

Alternative 3 (Bridges 2 & 7)

FOUNDATION LOADS and NUMBER of 24 in. PRESTRESSED PILES

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Bridge Width 43.08 Ft. | Number of lanes 3 | Number of Florida Double Tee = 6

Number of Spans	3 spans	4 spans	5 spans	6 spans	7 spans	8 spans	9 spans
Beam Type	IV	III	III	II	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	81.67 Ft.	61.75 Ft.	49.80 Ft.	41.83 Ft.	36.14 Ft.	31.88 Ft.	28.56 Ft.
Beam Span (ft)	79.67 Ft.	59.75 Ft.	47.80 Ft.	39.83 Ft.	34.14 Ft.	29.88 Ft.	26.56 Ft.
Bridge Deck Thickness (in)	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load							
Beam Load (End Bent)	401.5 k	274.1 k	221.0 k	169.0 k	146.0 k	128.8 k	115.4 k
Beam Load (Pier)	803.0 k	548.1 k	442.0 k	338.0 k	292.0 k	257.6 k	230.7 k
Live Load							
Reduction factor	0.9						
Impact factor for Substructure	1.0						
LL Reaction per lane (END BENT)							
Truck load	63.8 k	61.1 k	58.5 k	55.9 k	53.4 k	50.9 k	48.5 k
Lane load	52.1 k	45.8 k	41.9 k	39.4 k	37.6 k	36.2 k	35.1 k
Total Live Load (END BENT)	172.2 k	165.0 k	158.0 k	151.0 k	144.2 k	137.5 k	130.9 k
LL Reaction per lane (PIER)							
Truck load	65.1 k	62.9 k	60.8 k	58.6 k	56.5 k	54.4 k	52.4 k
Lane load	78.3 k	65.5 k	57.9 k	52.8 k	49.1 k	46.4 k	44.3 k
Total Live Load (PIER)	211.3 k	176.9 k	164.0 k	158.3 k	152.6 k	147.0 k	141.5 k
Total Load							
Superstructure Load (END BENT)	749.8 k	615.2 k	555.1 k	496.1 k	466.3 k	442.4 k	422.3 k
Superstructure Load (PIER)	1072.5 k	783.2 k	664.2 k	554.4 k	502.8 k	462.7 k	430.4 k
Foundation							
Maximum pile spacing	13.0 Ft.						
Service Load Capacity of Piles	**260.0 k**						
Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.						
Number of Piles Required For END BENT	4	4	4	4	4	4	4
Number of Piles Required For PIER	5	4	4	4	4	4	4
Service Design Load (END BENT)	187 k	154 k	139 k	124 k	117 k	111 k	106 k
Service Design Load (PIER)	214 k	196 k	166 k	139 k	126 k	116 k	108 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project

Preparation of Engineering Appendix For GRR/SEIS

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November 29, 2000

Alternative 3 (Bridges 2 & 7)

FOUNDATION LOADS on DRILLED SHAFT

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Bridge Width 43.08 Ft. | Number of lanes 3 | Number of Florida Double Tee = 6

Number of Spans	**3 spans**	**4 spans**	**5 spans**	**6 spans**	**7 spans**	**8 spans**	**9 spans**
Beam Type	IV	III	III	II	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	82.33 Ft.	62.50 Ft.	50.60 Ft.	42.67 Ft.	37.00 Ft.	32.75 Ft.	29.44 Ft.
Beam Span (ft)	80.33 Ft.	60.50 Ft.	48.60 Ft.	40.67 Ft.	35.00 Ft.	30.75 Ft.	27.44 Ft.
Bridge Deck Thickness (in)	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load							
Beam Load (End Bent)	404.8 k	277.4 k	224.6 k	172.4 k	149.5 k	132.3 k	119.0 k
Beam Load (Pier)	809.5 k	554.8 k	449.1 k	344.8 k	299.0 k	264.6 k	237.9 k
Live Load							
Reduction factor	0.9						
Impact factor for Substructure	1.0						
LL Reaction per lane (END BENT)							
Truck load	63.8 k	61.2 k	58.7 k	56.3 k	53.8 k	51.5 k	49.2 k
Lane load	52.3 k	46.0 k	42.2 k	39.7 k	37.8 k	36.5 k	35.4 k
Total Live Load (END BENT)	172.4 k	165.4 k	158.5 k	151.9 k	145.4 k	139.0 k	132.8 k
LL Reaction per lane (PIER)							
Truck load	65.2 k	63.0 k	60.9 k	58.9 k	56.9 k	54.9 k	53.0 k
Lane load	78.7 k	66.0 k	58.4 k	53.3 k	49.7 k	47.0 k	44.8 k
Total Live Load (PIER)	212.5 k	178.2 k	164.5 k	159.0 k	153.5 k	148.2 k	143.0 k
Total Load							
Superstructure Load (END BENT)	782.3 k	647.9 k	588.3 k	529.4 k	500.0 k	476.5 k	456.9 k
Superstructure Load (PIER)	1099.6 k	810.5 k	691.2 k	581.3 k	530.1 k	490.4 k	458.5 k
Foundation							
Maximum pile spacing	16.0 Ft.						
Location of Ext. shaft from coping at End Bent	6.0 Ft.						
Number of Piles Required For END BENT	3	3	3	3	3	3	3
Number of Piles Required For PIER	2	2	2	2	2	2	2
Service Design Load (END BENT)	261 k	216 k	196 k	176 k	167 k	159 k	152 k
Service Design Load (PIER)	550 k	405 k	346 k	291 k	265 k	245 k	229 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridges 2 & 7)	**INTERMEDIATE BENTS / PIERS**	Checked by: C. Li
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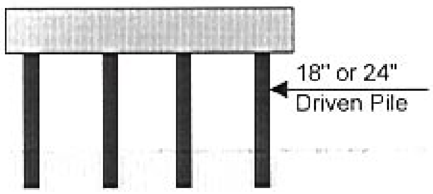
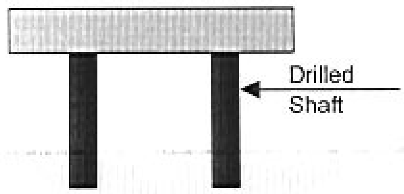


Intermediate Bent Section



Pier Section
(2 Drilled Shafts)

Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
Pile Length Above Ground	8 ft.	8 ft.	8 ft.
Total Length of Pile	27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area	9.0 sq.ft	9.0 sq.ft	12.0 sq.ft
Bent Cap Length	43 ft.	43 ft.	43 ft.
Total Concrete Volume	14.4 CY	14.4 CY	19.1 CY
Reinforcement at 145 lbs/CY	2082 lbs	2082 lbs	2776 lbs
Estimated Cost of Bent Cap	**$6,897**	**$6,897**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	**DRILLED SHAFT**	36 in.
Number of test loads per bridge	2 ea.	2 ea.	Number of test loads per bridge	1 ea.
			Core (Shaft Excavation)	
			Length of temporary casing	
Est. total cost of test piles w/ dynamic load test per bridge	$13,440	$13,440	% of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% of pile hole preformed	100%	100%	Excavation, unclassified extra depth	

Number of Spans	Number of Piles Required		Number of Drilled Shafts	Total Cost of Piles per Bent / Pier		Total Cost of Drilled Shaft	Total Estimated Cost of ONE Pier		
	18 in.	24 in.	36 in.	18" Pile	24" Pile	per Pier	18" Pile	24" Pile	36" Shaft
3	8	5	2	$15,536	$14,015	$34,680	$22,433	$20,912	$43,876
4	6	4	2	$11,092	$10,316	$26,347	$17,989	$17,213	$35,543
5	5	4	2	$8,870	$9,196	$22,180	$15,767	$16,093	$31,376
6	4	4	2	$7,096	$8,524	$19,680	$13,993	$15,421	$28,876
7	4	4	2	$6,648	$8,076	$18,013	$13,545	$14,973	$27,209
8	4	4	2	$6,328	$7,756	$16,823	$13,225	$14,653	$26,019
9	4	4	2	$6,088	$7,516	$15,930	$12,985	$14,413	$25,126

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridges 2 & 7)	END BENTS	Checked by: C. Li
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	Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
	Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
	Pile Length Above Ground	8 ft.	8 ft.	8 ft.
	Total Length of Pile	27 ft.	27 ft.	22 ft.
	Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
	Bent cap cross sectional area	7.5 sq.ft	7.5 sq.ft	12.0 sq.ft
	Bent Cap Length	43 ft.	43 ft.	43 ft.
	Total Concrete Volume	12.0 CY	12.0 CY	19.1 CY
Reinforcement at	145 lbs/CY	1735 lbs	1735 lbs	2776 lbs
	Estimated Cost of Bent Cap	**$5,747**	**$5,747**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	DRILLED SHAFTS	36 in.
			Core(Shaft Excavation)	
			Length of temporary casing	
			Percentage of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% Pile hole preformed	100%	100%	xcavation, unclassified extra depth	

Number of Spans	Number of Piles Required[1] 18 in.	Number of Piles Required[1] 24 in.	Number of Drilled Shafts[2] 36 in.	Total Cost of Piles per Bent / Pier 18" Pile	Total Cost of Piles per Bent / Pier 24" Pile	Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier 18" Pile	Total Estimated Cost of ONE Pier 24" Pile	Total Estimated Cost of ONE Pier 36" Shaft
3	8	6	5	$8,816	$8,754	$24,200	$27,951	$27,889	$46,783
4	7	6	5	$7,714	$8,754	$24,200	$24,181	$25,221	$44,115
5	6	6	5	$6,612	$8,754	$24,200	$23,079	$25,221	$44,115
6	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
7	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
8	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
9	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688

[1]Includes wingwall piles for Type IV, III, II beams.

[2]Includes wingwall drilled shafts for Type IV, III, II beams.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ

Done by: M. LeComte

Alternative 3 (Bridges 2 & 7)

SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISON

Checked by: C. Li

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type D Bridges 2 and 7.xls]SUPER_COMP

November 29, 2000

Number of Spans	ADJUSTED SPAN LENGTH 18 in. Pile	24 in. Pile	36 in. Shaft	Number of Piers	Cost of Substructure 18 in. Pile	24 in. Pile	36 in. Shaft	Cost of Superstructure 18 in. Pile	24 in. Pile	36 in. Shaft	Total Cost of Structure 18 in. Pile	24 in. Pile	36 in. Shaft
3	81.33 Ft.	81.67 Ft.	82.33 Ft.	2	$100,768	$97,602	$181,319	$186,394	$187,157	$188,685	$287,161	$284,759	$370,004
4	61.38 Ft.	61.75 Ft.	62.50 Ft.	3	$102,328	$102,080	$194,858	$170,845	$171,889	$173,977	$273,174	$273,969	$368,835
5	49.40 Ft.	49.80 Ft.	50.60 Ft.	4	$109,225	$114,813	$213,734	$171,889	$173,281	$176,065	$281,114	$288,094	$389,799
6	41.42 Ft.	41.83 Ft.	42.67 Ft.	5	$111,268	$122,692	$227,756	$160,011	$161,621	$164,840	$271,279	$284,313	$392,596
7	35.71 Ft.	36.14 Ft.	37.00 Ft.	6	$122,573	$135,425	$246,632	$160,977	$162,909	$166,772	$283,550	$298,334	$413,404
8	31.44 Ft.	31.88 Ft.	32.75 Ft.	7	$133,878	$148,158	$265,508	$161,943	$164,197	$168,704	$295,821	$312,354	$434,211
9	28.11 Ft.	28.56 Ft.	29.44 Ft.	8	$145,183	$160,891	$284,383	$162,909	$165,484	$170,636	$308,091	$326,375	$455,019

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

Number of Spans	Estimated Cost	Foundation Alternative	Superstructure Alternative	Number of Spans	Number of Beams	Number of Piles or Drilled Shafts	Total Length of Piles or Drilled Shafts	Number of Test Piles	Total Length of Test Piles
3	$284,759	24 in.	Type IV	3	4	20	540 ft	2	84 ft
4	$273,174	18 in.	Type III	4	4	30	810 ft	2	84 ft
5	$281,114	18 in.	Type III	5	4	30	810 ft	2	84 ft
6	$271,279	18 in.	Type II	6	4	30	810 ft	2	84 ft
7	$283,550	18 in.	Type II	7	4	34	918 ft	2	84 ft
8	$295,821	18 in.	Type II	8	4	38	1026 ft	2	84 ft
9	$308,091	18 in.	Type II	9	4	42	1134 ft	2	84 ft

$271,279 <--- Minimum

RESULT OF COST COMPARISON STUDY:

Most economical superstructure type: Type II
Most economical substructure type: 18 in.
Optimum Span Arrangement: 6 spans at 41.42 FT.
Total bridge length: 248.50 Ft.
Total number of beams: 24
Total length of beams: 994.00 Ft.
Number of piles or drilled Shafts: 30
Length of Piles or drilled Shafts: 810.00 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridges 2 & 7)	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
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Item	Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:				
Concrete	264.5	CY	$310	$81,990
Reinforcing Steel[1]	54219	LBS	$0.45	$24,399
Bridge Floor Grooving	1104	SY	$2.50	$2,761
Traffic Railing Barrier	497.0	FT	$35	$17,395
Expansion Joints[3]	86.2	FT	$84	$7,238
Type II Beam	994.0	FT	$54	$53,676
Neoprene Bearing Pads	5.251	CY	$425	$2,232
		Superstructure Subtotal		$189,690
SUBSTRUCTURE:				
Concrete	130.1	CY	$415	$53,997
Reinforcing Steel[2]	18866	LBS	$0.45	$8,490
Pile Hole, Preformed	30	EA	$200	$6,000
Test Piles	84	Ft.	$160	$13,440
18 in. Prestressed Concrete Piles (F & I)	810	Ft.	$33	$26,730
Pile Splices	3	EA	$110	$330
Drilled shaft		LF	$220	
Test load for drilled shaft		EA	$50,000	
Core (Shaft Excavation)		LF		
Temporary casing		LF		
Casing splice		EA		
Excavation, unclassified shaft		LF		
Drilled shaft sidewall overreaming		LF		
Excavation, unclassified extra depth		LF		
		Substructure Subtotal		$108,987
		Construction Cost Subtotal		**$298,677**
Mobilization (5% of Construction Cost)	1	LS		$ 14,934
Contingency (15% of Construction Cost)	1	LS		$ 44,802
		Total Construction Cost		**$358,412**
		Deck Square Footage (Ft.)		10,706
		Cost Per Square Foot		**$33.48/sf**

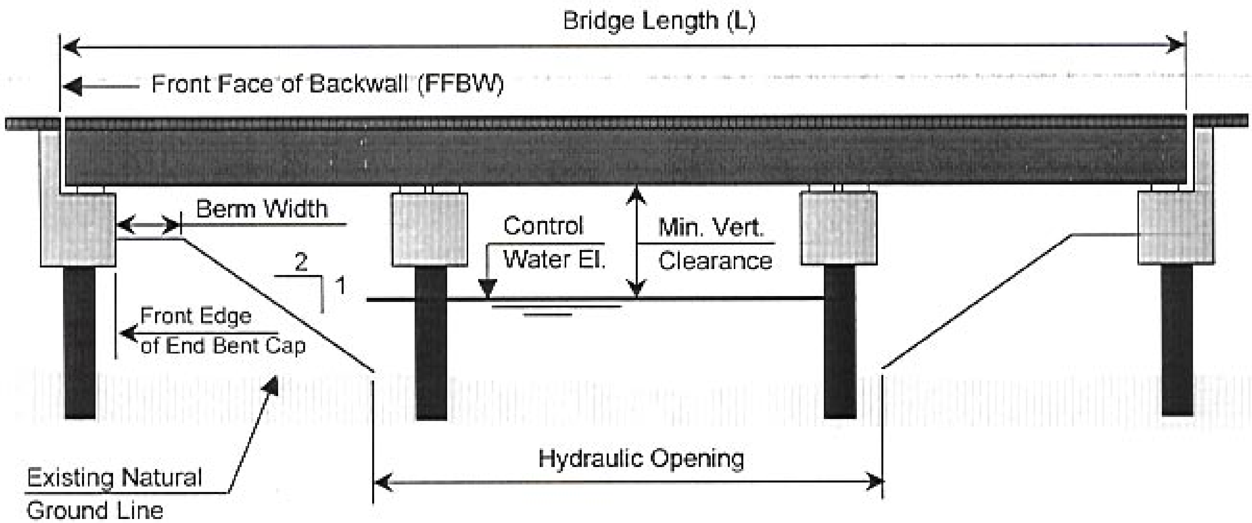
[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

[3]Number of expansion piers: 2

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBS&J Done by: M. LeComte
Alternative 3 (Bridge 3)	BRIDGE AND SPAN LENGTHS	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type E Bridge 3.xls]LENGTH		November 29, 2000

Determine Bridge Length based on hydraulic opening:



Hydraulic Opening Width at Natural Ground Level	150.00 Ft.
Natural Ground Elevation	5.00 Ft.
Control Water Elevation	9.00 Ft.
Minimum Clearance over Control Water Elevation	6.00 Ft.
Berm Width	3.00 Ft.
Vertical Distance from bottom of beams to top of Berm where slope starts	2.25 Ft.
Distance From FFBW to Front Edge of End Bent Cap	2.00 Ft.
Minimum Span length	28.00 Ft.
Preliminary Bridge Length (No adjustment due to pile/drilled shaft in the opening), L' =	**191.00 Ft.**

Number of Spans	ADJUSTED BRIDGE LENGTH (L)			ADJUSTED SPAN LENGTH		
	18 in. Pile	24 in. Pile	36 in. Drilled Shaft	18 in. Pile	24 in. Pile	36 in. Drilled Shaft
2	192.50 Ft.	193.00 Ft.	194.00 Ft.	96.25 Ft.	96.50 Ft.	97.00 Ft.
3	194.00 Ft.	195.00 Ft.	197.00 Ft.	64.67 Ft.	65.00 Ft.	65.67 Ft.
4	195.50 Ft.	197.00 Ft.	200.00 Ft.	48.88 Ft.	49.25 Ft.	50.00 Ft.
5	197.00 Ft.	199.00 Ft.	203.00 Ft.	39.40 Ft.	39.80 Ft.	40.60 Ft.
6	198.50 Ft.	201.00 Ft.	206.00 Ft.	33.08 Ft.	33.50 Ft.	34.33 Ft.
7	200.00 Ft.	203.00 Ft.	209.00 Ft.	28.57 Ft.	29.00 Ft.	29.86 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridge 3)	BEAM SPACING vs. DESIGN SPAN	Checked by: C. Li
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Determine beam spacing and design span:

Bridge Width: 43.08 Ft.
Slab Thickness: 8.00 in.

Number of Beams	[1]Beam Spacing	[2]Design Span					
		AASHTO Type II	AASHTO Type III	AASHTO Type IV	18" Double T	24" Double T	30" Double T
4	10.77 Ft.	**46.00 Ft.**	**65.00 Ft.**	**84.00 Ft.**			
5	8.62 Ft.	**52.00 Ft.**	**73.00 Ft.**	**90.00 Ft.**			
6	7.18 Ft.	**58.00 Ft.**	**78.00 Ft.**	**96.00 Ft.**	**40.00 Ft.**	**50.00 Ft.**	**60.00 Ft.**
7	6.15 Ft.	**62.00 Ft.**	**82.00 Ft.**	**98.00 Ft.**			
8	5.39 Ft.	**66.00 Ft.**	**84.00 Ft.**	**102.00 Ft.**			

[1]Beam spacing is based on assuming the cantilever to be half of the beam spacing.

[2]Design spans are determined from the charts based on the beam spacing given.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridge 3)	AASHTO BEAMS COMPARISON	Checked by: C. Li
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Number of Spans	Adjusted Span Length			Number of AASHTO Beams Required								
	PILES		Drilled Shaft	18" Piles			24" Piles			Drilled Shaft		
	18 in.	24 in.		II	III	IV	II	III	IV	II	III	IV
2	96.25 Ft.	96.50 Ft.	97.00 Ft.			7			7			7
3	64.67 Ft.	65.00 Ft.	65.67 Ft.	8	4	4	8	4	4	8	5	4
4	48.88 Ft.	49.25 Ft.	50.00 Ft.	5	4	4	5	4	4	5	4	4
5	39.40 Ft.	39.80 Ft.	40.60 Ft.	4	4	4	4	4	4	4	4	4
6	33.08 Ft.	33.50 Ft.	34.33 Ft.	4	4	4	4	4	4	4	4	4
7	28.57 Ft.	29.00 Ft.	29.86 Ft.	4	4	4	4	4	4	4	4	4

Number of Spans	Estimated Construction Cost of AASHTO Beams								
	18 in. Piles			24 in. Piles			DRILLED SHAFT		
	II	III	IV	II	III	IV	II	III	IV
2	N/A	N/A	$113,190	N/A	N/A	$113,484	N/A	N/A	$114,072
3	$83,808	$51,992	$65,184	$84,240	$52,260	$65,520	$85,104	$65,995	$66,192
4	$52,785	$52,394	$65,688	$53,190	$52,796	$66,192	$54,000	$53,600	$67,200
5	$42,552	$52,796	$66,192	$42,984	$53,332	$66,864	$43,848	$54,404	$68,208
6	$42,876	$53,198	$66,696	$43,416	$53,868	$67,536	$44,496	$55,208	$69,216
7	$43,200	$53,600	$67,200	$43,848	$54,404	$68,208	$45,144	$56,012	$70,224

Number of Spans	Most Economical AASHTO Beam Type					
	18" PILES		24" PILES		DRILLED SHAFT	
	TYPE	COST	TYPE	COST	TYPE	COST
2	IV	$113,190	IV	$113,484	IV	$114,072
3	III	$51,992	III	$52,260	III	$65,995
4	III	$52,394	III	$52,796	III	$53,600
5	II	$42,552	II	$42,984	II	$43,848
6	II	$42,876	II	$43,416	II	$44,496
7	II	$43,200	II	$43,848	II	$45,144

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBSJ Done by: M. LeComte
Alternative 3 (Bridge 3) — SUPERSTRUCTURE ALTERNATIVES COMPARISON	Checked by: C. Li
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Number	AASHTO BEAMS WITH DECK						Florida Double Tee Beams					
of	18" PILES		24" PILES		DRILLED SHAF		18" PILES		24" PILES		DRILLED SHAF	
Spans	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST
2	IV	$195,562	IV	$196,070	IV	$197,086	N/A		N/A		N/A	
3	III	$135,006	III	$135,702	III	$150,293	N/A		N/A		N/A	
4	III	$136,050	III	$137,094	III	$139,182	FDT24	$252,195	FDT24	$254,130	FDT24	$258,000
5	II	$126,850	II	$128,138	II	$130,713	FDT18	$212,760	FDT18	$214,920	FDT24	$261,870
6	II	$127,816	II	$129,425	II	$132,645	FDT18	$214,380	FDT18	$217,080	FDT18	$222,480
7	II	$128,782	II	$130,713	II	$134,577	FDT18	$216,000	FDT18	$219,240	FDT18	$225,720

Deck Reinforcement 205 lbs/CY concrete
Cost of Deck per foot $428/ft.

Number	PRECAST SLAB						MOST ECONOMICAL SUPERSTRUCTURE ALTERNATIVE								
of	18" PILES		24" PILES		DRILLED SHAF		18 in. Pile			24 in. Pile			36 in. Shaft		
Spans	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost
2							7	IV	$195,562	7	IV	$196,070	7	IV	$197,086
3							4	III	$135,006	4	III	$135,702	5	III	$150,293
4							4	III	$136,050	4	III	$137,094	4	III	$139,182
5	23	$451,876	23	$456,464			4	II	$126,850	4	II	$128,138	4	II	$130,713
6	20	$395,928	20	$400,914	21	$431,432	4	II	$127,816	4	II	$129,425	4	II	$132,645
7	18	$359,028	18	$364,413	19	$396,028	4	II	$128,782	4	II	$130,713	4	II	$134,577

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
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November 29, 2000

Alternative 3 (Bridge 3)

FOUNDATION LOADS and NUMBER of 18 in. PRESTRESSED PILES

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type E Bridge 3.xls]LENGTH

Bridge Width 43.08 Ft. | Number of lanes 3 | Number of Florida Double Tee = 6

Number of Spans	2 spans	3 spans	4 spans	5 spans	6 spans	7 spans
Beam Type	IV	III	III	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	7 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	96.25 Ft.	64.67 Ft.	48.88 Ft.	39.40 Ft.	33.08 Ft.	28.57 Ft.
Beam Span (ft)	94.25 Ft.	62.67 Ft.	46.88 Ft.	37.40 Ft.	31.08 Ft.	26.57 Ft.
Bridge Deck Thickness (in)	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load						
Beam Load (End Bent)	591.9 k	287.0 k	216.9 k	159.2 k	133.7 k	115.4 k
Beam Load (Pier)	1183.7 k	574.0 k	433.8 k	318.4 k	267.3 k	230.9 k
Live Load						
Reduction factor	0.9					
Impact factor for Substructure	1.0					
LL Reaction per lane (END BENT)						
Truck load	65.0 k	61.6 k	58.3 k	54.9 k	51.7 k	48.5 k
Lane load	56.8 k	46.7 k	41.6 k	38.6 k	36.6 k	35.1 k
Total Live Load (END BENT)	175.5 k	166.3 k	157.3 k	148.3 k	139.6 k	130.9 k
LL Reaction per lane (PIER)						
Truck load	66.2 k	63.3 k	60.5 k	57.8 k	55.1 k	52.4 k
Lane load	87.6 k	67.4 k	57.3 k	51.2 k	47.2 k	44.3 k
Total Live Load (PIER)	236.5 k	181.9 k	163.5 k	156.0 k	148.7 k	141.5 k
Total Load						
Superstructure Load (END BENT)	943.5 k	629.4 k	550.3 k	483.6 k	449.3 k	422.4 k
Superstructure Load (PIER)	1478.4 k	814.1 k	655.5 k	532.6 k	474.2 k	430.5 k
Foundation						
Maximum pile spacing	13.0 Ft.					
Service Load Capacity of Piles	147.0 k					
Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.					
Number of Piles Required For END BENT	7	5	4	4	4	4
Number of Piles Required For PIER	11	6	5	4	4	4
Service Design Load (END BENT)	135 k	126 k	138 k	121 k	112 k	106 k
Service Design Load (PIER)	134 k	136 k	131 k	133 k	119 k	108 k

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Alternative 3 (Bridge 3)

FOUNDATION LOADS and NUMBER of 24 in. PRESTRESSED PILES

I:\STRUCT\Design\Tamiami-Trail\design\cost analysis\alternative-3\[Type E Bridge 3.xls]LENGTH

Bridge Width 43.08 Ft.	Number of lanes 3	Number of Florida Double Tee = 6

Number of Spans	2 spans	3 spans	4 spans	5 spans	6 spans	7 spans
Beam Type	IV	III	III	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	7 beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	96.50 Ft.	65.00 Ft.	49.25 Ft.	39.80 Ft.	33.50 Ft.	29.00 Ft.
Beam Span (ft)	94.50 Ft.	63.00 Ft.	47.25 Ft.	37.80 Ft.	31.50 Ft.	27.00 Ft.
Bridge Deck Thickness (in)	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load						
Beam Load (End Bent)	593.4 k	288.5 k	218.6 k	160.8 k	135.3 k	117.2 k
Beam Load (Pier)	1186.8 k	577.0 k	437.2 k	321.6 k	270.7 k	234.3 k
Live Load						
Reduction factor	0.9					
Impact factor for Substructure	1.0					
LL Reaction per lane (END BENT)						
Truck load	65.0 k	61.7 k	58.4 k	55.1 k	51.9 k	48.8 k
Lane load	56.9 k	46.8 k	41.8 k	38.7 k	36.7 k	35.3 k
Total Live Load (END BENT)	175.6 k	166.5 k	157.6 k	148.8 k	140.2 k	131.8 k
LL Reaction per lane (PIER)						
Truck load	66.2 k	63.4 k	60.6 k	57.9 k	55.3 k	52.7 k
Lane load	87.8 k	67.6 k	57.5 k	51.5 k	47.4 k	44.6 k
Total Live Load (PIER)	237.0 k	182.5 k	163.7 k	156.4 k	149.3 k	142.3 k
Total Load						
Superstructure Load (END BENT)	945.1 k	631.1 k	552.2 k	485.7 k	451.7 k	425.1 k
Superstructure Load (PIER)	1481.9 k	817.6 k	659.0 k	536.2 k	478.1 k	434.8 k
Foundation						
Maximum pile spacing	13.0 Ft.					
Service Load Capacity of Piles	260.0 k					
Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.					
Number of Piles Required For END BENT	4	4	4	4	4	4
Number of Piles Required For PIER	6	4	4	4	4	4
Service Design Load (END BENT)	236 k	158 k	138 k	121 k	113 k	106 k
Service Design Load (PIER)	247 k	204 k	165 k	134 k	120 k	109 k

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Alternative 3 (Bridge 3)

FOUNDATION LOADS on DRILLED SHAFT

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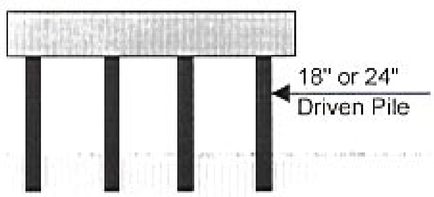
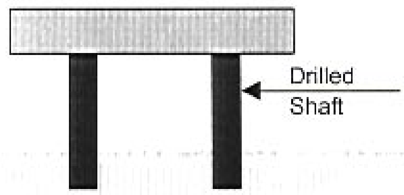
Bridge Width 43.08 Ft. Number of lanes 3 Number of Florida Double Tee = 6

Number of Spans	2 spans	3 spans	4 spans	5 spans	6 spans	7 spans
Beam Type	IV	III	III	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	7 beams	5 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	97.00 Ft.	65.67 Ft.	50.00 Ft.	40.60 Ft.	34.33 Ft.	29.86 Ft.
Beam Span (ft)	95.00 Ft.	63.67 Ft.	48.00 Ft.	38.60 Ft.	32.33 Ft.	27.86 Ft.
Bridge Deck Thickness (in)	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load						
Beam Load (End Bent)	596.5 k	310.6 k	221.9 k	164.0 k	138.7 k	120.6 k
Beam Load (Pier)	1192.9 k	621.2 k	443.8 k	328.1 k	277.4 k	241.3 k
Live Load						
Reduction factor	0.9					
Impact factor for Substructure	1.0					
LL Reaction per lane (END BENT)						
Truck load	65.1 k	61.8 k	58.6 k	55.4 k	52.4 k	49.5 k
Lane load	57.0 k	47.0 k	42.0 k	39.0 k	37.0 k	35.6 k
Total Live Load (END BENT)	175.7 k	166.8 k	158.1 k	149.7 k	141.6 k	133.6 k
LL Reaction per lane (PIER)						
Truck load	66.2 k	63.5 k	60.8 k	58.2 k	55.7 k	53.2 k
Lane load	88.1 k	68.0 k	58.0 k	52.0 k	48.0 k	45.1 k
Total Live Load (PIER)	237.8 k	183.7 k	164.2 k	157.2 k	150.4 k	143.8 k
Total Load						
Superstructure Load (END BENT)	977.3 k	682.5 k	585.2 k	518.9 k	485.5 k	459.4 k
Superstructure Load (PIER)	1508.3 k	882.4 k	685.5 k	562.8 k	505.3 k	462.6 k
Foundation						
Maximum pile spacing	16.0 Ft.					
Location of Ext. shaft from coping at End Bent	6.0 Ft.					
Number of Piles Required For END BENT	3	3	3	3	3	3
Number of Piles Required For PIER	2	2	2	2	2	2
Service Design Load (END BENT)	326 k	228 k	195 k	173 k	162 k	153 k
Service Design Load (PIER)	754 k	441 k	343 k	281 k	253 k	231 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridge 3)	**INTERMEDIATE BENTS / PIERS**	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type E Bridge 3.xls]LENGTH		November 29, 2000



Intermediate Bent Section



Pier Section
(2 Drilled Shafts)

Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
Pile Length Above Ground	8 ft.	8 ft.	8 ft.
Total Length of Pile	27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area	9.0 sq.ft	9.0 sq.ft	12.0 sq.ft
Bent Cap Length	43 ft.	43 ft.	43 ft.
Total Concrete Volume	14.4 CY	14.4 CY	19.1 CY
Reinforcement at 145 lbs/CY	2082 lbs	2082 lbs	2776 lbs
Estimated Cost of Bent Cap	**$6,897**	**$6,897**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	**DRILLED SHAFT**	36 in.
Number of test loads per bridge	2 ea.	2 ea.	Number of test loads per bridge	1 ea.
			Core (Shaft Excavation)	
			Length of temporary casing	
Est. total cost of test piles w/ dynamic load test per bridge	$13,440	$13,440	% of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% of pile hole preformed	100%	100%	Excavation, unclassified extra depth	

Number of Spans	Number of Piles Required		Number of Drilled Shafts	Total Cost of Piles per Bent / Pier		Total Cost of Drilled Shaft	Total Estimated Cost of ONE Pier		
	18 in.	24 in.	36 in.	18" Pile	24" Pile	per Pier	18" Pile	24" Pile	36" Shaft
2	11	6	2	$25,562	$22,194	$59,680	$32,459	$29,091	$68,876
3	6	4	2	$13,332	$12,556	$34,680	$20,229	$19,453	$43,876
4	5	4	2	$9,990	$10,316	$26,347	$16,887	$17,213	$35,543
5	4	4	2	$7,768	$9,196	$22,180	$14,665	$16,093	$31,376
6	4	4	2	$7,096	$8,524	$19,680	$13,993	$15,421	$28,876
7	4	4	2	$6,648	$8,076	$18,013	$13,545	$14,973	$27,209

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBS&J Done by: M. LeComte
Alternative 3 (Bridge 3)	END BENTS	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type E Bridge 3.xls]LENGTH		November 29, 2000

Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
Pile Length Above Ground	8 ft.	8 ft.	8 ft.
Total Length of Pile	27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area	7.5 sq.ft	7.5 sq.ft	12.0 sq.ft
Bent Cap Length	43 ft.	43 ft.	43 ft.
Total Concrete Volume	12.0 CY	12.0 CY	19.1 CY
Reinforcement at 145 lbs/CY	1735 lbs	1735 lbs	2776 lbs
Estimated Cost of Bent Cap	**$5,747**	**$5,747**	**$9,196**

PRESTRESSED PILES	18 in.	24 in.	DRILLED SHAFTS	36 in.
			Core(Shaft Excavation)	
			Length of temporary casing	
			Percentage of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% Pile hole preformed	100%	100%	xcavation, unclassified extra depth	

Number of Spans	Number of Piles Required[1]		Number of Drilled Shafts[2]	Total Cost of Piles per Bent / Pier		Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier		
	18 in.	24 in.	36 in.	18" Pile	24" Pile		18" Pile	24" Pile	36" Shaft
2	9	6	5	$9,918	$8,754	$24,200	$29,053	$27,889	$46,783
3	7	6	5	$7,714	$8,754	$24,200	$24,181	$25,221	$44,115
4	6	6	5	$6,612	$8,754	$24,200	$23,079	$25,221	$44,115
5	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
6	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688
7	6	6	5	$6,612	$8,754	$24,200	$20,652	$22,794	$41,688

[1]Includes wingwall piles for Type IV, III, II beams.

[2]Includes wingwall drilled shafts for Type IV, III, II beams.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

PBSJ
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November 29, 2000

Alternative 3 (Bridge 3)

SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISON

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Number	ADJUSTED SPAN LENGTH			Number	Cost of Substructure			Cost of Superstructure			Total Cost of Structure		
of Spans	18 in. Pile	24 in. Pile	36 in. Shaft	of Piers	18 in. Pile	24 in. Pile	36 in. Shaft	18 in. Pile	24 in. Pile	36 in. Shaft	18 in. Pile	24 in. Pile	36 in. Shaft
2	96.25 Ft.	96.50 Ft.	97.00 Ft.	1	$90,565	$84,869	$162,443	$195,562	$196,070	$197,086	$286,127	$280,939	$359,529
3	64.67 Ft.	65.00 Ft.	65.67 Ft.	2	$88,819	$89,347	$175,982	$135,006	$135,702	$150,293	$223,825	$225,049	$326,275
4	48.88 Ft.	49.25 Ft.	50.00 Ft.	3	$96,818	$102,080	$194,858	$136,050	$137,094	$139,182	$232,868	$239,174	$334,040
5	39.40 Ft.	39.80 Ft.	40.60 Ft.	4	$99,963	$109,959	$208,880	$126,850	$128,138	$130,713	$226,813	$238,097	$339,593
6	33.08 Ft.	33.50 Ft.	34.33 Ft.	5	$111,268	$122,692	$227,756	$127,816	$129,425	$132,645	$239,084	$252,117	$360,401
7	28.57 Ft.	29.00 Ft.	29.86 Ft.	6	$122,573	$135,425	$246,632	$128,782	$130,713	$134,577	$251,354	$266,138	$381,208

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

Number of Spans	Estimated Cost	Foundation Alternative	Superstructure Alternative	Number of Spans	Number of Beams	Number of Piles or Drilled Shafts	Total Length of Piles or Drilled Shafts	Number of Test Piles	Total Length of Test Piles
2	$280,939	24 in.	Type IV	2	7	16	432 ft	2	84 ft
3	$223,825	18 in.	Type III	3	4	24	648 ft	2	84 ft
4	$232,868	18 in.	Type III	4	4	25	675 ft	2	84 ft
5	$226,813	18 in.	Type II	5	4	26	702 ft	2	84 ft
6	$239,084	18 in.	Type II	6	4	30	810 ft	2	84 ft
7	$251,354	18 in.	Type II	7	4	34	918 ft	2	84 ft

$223,825 <--- Minimum

RESULT OF COST COMPARISON STUDY:

Most economical superstructure type: Type III
Most economical substructure type: 18 in.
Optimum Span Arrangement: 3 spans at 64.67 FT.
Total bridge length: 194.00 Ft.
Total number of beams: 12
Total length of beams: 776.00 Ft.
Number of piles or drilled Shafts: 24
Length of Piles or drilled Shafts: 648.00 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridge 3)	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type E Bridge 3.xls]LENGTH		November 29, 2000

Item	Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:				
Concrete	206.5	CY	$310	$64,008
Reinforcing Steel[1]	42328	LBS	$0.45	$19,048
Bridge Floor Grooving	862	SY	$2.50	$2,156
Traffic Railing Barrier	388.0	FT	$35	$13,580
Expansion Joints[3]	86.2	FT	$84	$7,238
Type III Beam	776.0	FT	$67	$51,992
Neoprene Bearing Pads	0.094	CY	$425	$40
		Superstructure Subtotal		$158,061
SUBSTRUCTURE:				
Concrete	97.1	CY	$415	$40,292
Reinforcing Steel[2]	14078	LBS	$0.45	$6,335
Pile Hole, Preformed	24	EA	$200	$4,800
Test Piles	84	Ft.	$160	$13,440
18 in. Prestressed Concrete Piles (F & I)	648	Ft.	$33	$21,384
Pile Splices	3	EA	$110	$330
Drilled shaft		LF	$220	
Test load for drilled shaft		EA	$50,000	
Core (Shaft Excavation)		LF		
Temporary casing		LF		
Casing splice		EA		
Excavation, unclassified shaft		LF		
Drilled shaft sidewall overreaming		LF		
Excavation, unclassified extra depth		LF		
		Substructure Subtotal		$86,581
		Construction Cost Subtotal		**$244,642**
Mobilization (5% of Construction Cost)	1	LS		$ 12,232
Contingency (15% of Construction Cost)	1	LS		$ 36,696
		Total Construction Cost		**$293,571**
		Deck Square Footage (Ft.)		8,358
		Cost Per Square Foot		**$35.12/sf**

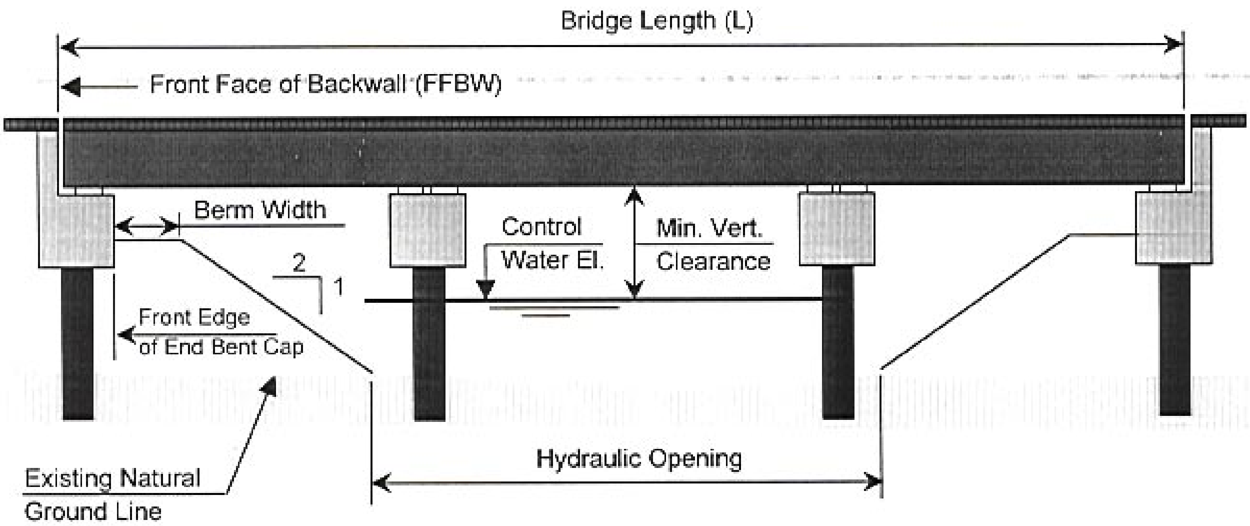
[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

[3]Number of expansion piers: 2

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridge 4)	BRIDGE AND SPAN LENGTHS	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type F Bridge 4.xls]COST		November 29, 2000

Determine Bridge Length based on hydraulic opening:



Hydraulic Opening Width at Natural Ground Level	125.00 Ft.
Natural Ground Elevation	5.00 Ft.
Control Water Elevation	8.50 Ft.
Minimum Clearance over Control Water Elevation	6.00 Ft.
Berm Width	3.00 Ft.
Vertical Distance from bottom of beams to top of Berm where slope starts	2.25 Ft.
Distance From FFBW to Front Edge of End Bent Cap	2.00 Ft.
Minimum Span length	28.00 Ft.
Preliminary Bridge Length (No adjustment due to pile/drilled shaft in the opening), L' =	**164.00 Ft.**

Number of Spans	ADJUSTED BRIDGE LENGTH (L)			ADJUSTED SPAN LENGTH		
	18 in. Pile	24 in. Pile	36 in. Drilled Shaft	18 in. Pile	24 in. Pile	36 in. Drilled Shaft
2	165.50 Ft.	166.00 Ft.	167.00 Ft.	82.75 Ft.	83.00 Ft.	83.50 Ft.
3	167.00 Ft.	168.00 Ft.	170.00 Ft.	55.67 Ft.	56.00 Ft.	56.67 Ft.
4	168.50 Ft.	170.00 Ft.	173.00 Ft.	42.13 Ft.	42.50 Ft.	43.25 Ft.
5	170.00 Ft.	172.00 Ft.	176.00 Ft.	34.00 Ft.	34.40 Ft.	35.20 Ft.
6	171.50 Ft.	174.00 Ft.	179.00 Ft.	28.58 Ft.	29.00 Ft.	29.83 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridge 4)	**BEAM SPACING vs. DESIGN SPAN**	Checked by: C. Li
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Determine beam spacing and design span:

Bridge Width: 35.08 Ft.
Slab Thickness: 8.00 in.

Number of Beams	[1]Beam Spacing	[2]Design Span					
		AASHTO Type II	AASHTO Type III	AASHTO Type IV	18" Double T	24" Double T	30" Double T
4	8.77 Ft.	**46.00 Ft.**	**65.00 Ft.**	**84.00 Ft.**			
5	7.02 Ft.	**52.00 Ft.**	**73.00 Ft.**	**90.00 Ft.**			
6	5.85 Ft.	**58.00 Ft.**	**78.00 Ft.**	**96.00 Ft.**	**40.00 Ft.**	**50.00 Ft.**	**60.00 Ft.**
7	5.01 Ft.	**62.00 Ft.**	**82.00 Ft.**	**98.00 Ft.**			
8	4.39 Ft.	**66.00 Ft.**	**84.00 Ft.**	**102.00 Ft.**			

[1]Beam spacing is based on assuming the cantilever to be half of the beam spacing.

[2]Design spans are determined from the charts based on the beam spacing given.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridge 4)	**AASHTO BEAMS COMPARISON**	Checked by: C. Li
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Number of Spans	Adjusted Span Length			Number of AASHTO Beams Required								
	PILES		Drilled Shaft	18" Piles			24" Piles			Drilled Shaft		
	18 in.	24 in.		II	III	IV	II	III	IV	II	III	IV
2	82.75 Ft.	83.00 Ft.	83.50 Ft.		8	4		8	4		8	4
3	55.67 Ft.	56.00 Ft.	56.67 Ft.	6	4	4	6	4	4	6	4	4
4	42.13 Ft.	42.50 Ft.	43.25 Ft.	4	4	4	4	4	4	4	4	4
5	34.00 Ft.	34.40 Ft.	35.20 Ft.	4	4	4	4	4	4	4	4	4
6	28.58 Ft.	29.00 Ft.	29.83 Ft.	4	4	4	4	4	4	4	4	4

Number of Spans	Estimated Construction Cost of AASHTO Beams								
	18 in. Piles			24 in. Piles			DRILLED SHAFT		
	II	III	IV	II	III	IV	II	III	IV
2	N/A	$88,708	$55,608	N/A	$88,976	$55,776	N/A	$89,512	$56,112
3	$54,108	$44,756	$56,112	$54,432	$45,024	$56,448	$55,080	$45,560	$57,120
4	$36,396	$45,158	$56,616	$36,720	$45,560	$57,120	$37,368	$46,364	$58,128
5	$36,720	$45,560	$57,120	$37,152	$46,096	$57,792	$38,016	$47,168	$59,136
6	$37,044	$45,962	$57,624	$37,584	$46,632	$58,464	$38,664	$47,972	$60,144

Number of Spans	Most Economical AASHTO Beam Type					
	18" PILES		24" PILES		DRILLED SHAFT	
	TYPE	COST	TYPE	COST	TYPE	COST
2	IV	$55,608	IV	$55,776	IV	$56,112
3	III	$44,756	III	$45,024	III	$45,560
4	II	$36,396	II	$36,720	II	$37,368
5	II	$36,720	II	$37,152	II	$38,016
6	II	$37,044	II	$37,584	II	$38,664

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBS&J Done by: M. LeComte
Alternative 3 (Bridge 4) — SUPERSTRUCTURE ALTERNATIVES COMPARISON	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type F Bridge 4.xls]COST	November 29, 2000

Number of Spans	AASHTO BEAMS WITH DECK						Florida Double Tee Beams					
	18" PILES		24" PILES		DRILLED SHAF		18" PILES		24" PILES		DRILLED SHAF	
	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST	TYPE	COST
2	IV	$113,277	IV	$113,619	IV	$114,303	N/A		N/A		N/A	
3	III	$102,947	III	$103,564	III	$104,797	FDT30	$250,500	FDT30	$252,000	FDT30	$255,000
4	II	$95,110	II	$95,957	II	$97,650	FDT24	$217,365	FDT24	$219,300	FDT24	$223,170
5	II	$95,957	II	$97,086	II	$99,343	FDT18	$183,600	FDT18	$185,760	FDT18	$190,080
6	II	$96,803	II	$98,214	II	$101,037	FDT18	$185,220	FDT18	$187,920	FDT18	$193,320

Deck Reinforcement 205 lbs/CY concrete

Cost of Deck per foot $348/ft.

Number of Spans	PRECAST SLAB						MOST ECONOMICAL SUPERSTRUCTURE ALTERNATIVE								
	18" PILES		24" PILES		DRILLED SHAF		18 in. Pile			24 in. Pile			36 in. Shaft		
	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Thick-ness	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost	Number of Beams	Beam Type	Estimated Cost
2							4	IV	$113,277	4	IV	$113,619	4	IV	$114,303
3							4	III	$102,947	4	III	$103,564	4	III	$104,797
4							4	II	$95,110	4	II	$95,957	4	II	$97,650
5	21	$289,925	21	$293,336	21	$300,157	4	II	$95,957	4	II	$97,086	4	II	$99,343
6	18	$250,700	18	$254,354	19	$276,200	4	II	$96,803	4	II	$98,214	4	II	$101,037

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

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November 29, 2000

Alternative 3 (Bridge 4)

FOUNDATION LOADS and NUMBER of 18 in. PRESTRESSED PILES

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Bridge Width 35.08 Ft. | Number of lanes 2 | Number of Florida Double Tee = 5

Number of Spans	2 spans	3 spans	4 spans	5 spans	6 spans
Beam Type	IV	III	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	82.75 Ft.	55.67 Ft.	42.13 Ft.	34.00 Ft.	28.58 Ft.
Beam Span (ft)	80.75 Ft.	53.67 Ft.	40.13 Ft.	32.00 Ft.	26.58 Ft.
Bridge Deck Thickness (in)	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load					
Beam Load (End Bent)	362.1 k	217.0 k	147.4 k	119.0 k	100.0 k
Beam Load (Pier)	724.3 k	434.0 k	294.9 k	238.0 k	200.1 k
Live Load					
Reduction factor	1.0				
Impact factor for Substructure	1.0				
LL Reaction per lane (END BENT)					
Truck load	63.9 k	59.9 k	56.0 k	52.2 k	48.5 k
Lane load	52.5 k	43.8 k	39.5 k	36.9 k	35.1 k
Total Live Load (END BENT)	127.8 k	119.9 k	112.1 k	104.5 k	97.0 k
LL Reaction per lane (PIER)					
Truck load	65.2 k	61.9 k	58.7 k	55.5 k	52.4 k
Lane load	79.0 k	61.6 k	53.0 k	47.8 k	44.3 k
Total Live Load (PIER)	157.9 k	123.9 k	117.4 k	111.1 k	104.8 k
Total Load					
Superstructure Load (END BENT)	633.3 k	480.3 k	402.9 k	366.9 k	340.4 k
Superstructure Load (PIER)	929.5 k	605.2 k	459.7 k	396.4 k	352.3 k
Foundation					
Maximum pile spacing	13.0 Ft.				
Service Load Capacity of Piles	147.0 k				
Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.				
Number of Piles Required For END BENT	5	4	4	4	4
Number of Piles Required For PIER	7	5	4	4	4
Service Design Load (END BENT)	127 k	120 k	101 k	92 k	85 k
Service Design Load (PIER)	133 k	121 k	115 k	99 k	88 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

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November 29, 2000

Alternative 3 (Bridge 4)

FOUNDATION LOADS and NUMBER of 24 in. PRESTRESSED PILES

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Bridge Width 35.08 Ft. | Number of lanes 2 | Number of Florida Double Tee – 5

	2 spans	3 spans	4 spans	5 spans	6 spans
Number of Spans	2 spans	3 spans	4 spans	5 spans	6 spans
Beam Type	IV	III	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	83.00 Ft.	56.00 Ft.	42.50 Ft.	34.40 Ft.	29.00 Ft.
Beam Span (ft)	81.00 Ft.	54.00 Ft.	40.50 Ft.	32.40 Ft.	27.00 Ft.
Bridge Deck Thickness (in)	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load					
Beam Load (End Bent)	363.2 k	218.3 k	148.8 k	120.4 k	101.5 k
Beam Load (Pier)	726.4 k	436.6 k	297.5 k	240.8 k	203.0 k
Live Load					
Reduction factor	1.0				
Impact factor for Substructure	1.0				
LL Reaction per lane (END BENT)					
Truck load	63.9 k	60.0 k	56.2 k	52.5 k	48.8 k
Lane load	52.6 k	43.9 k	39.6 k	37.0 k	35.3 k
Total Live Load (END BENT)	127.8 k	120.0 k	112.4 k	104.9 k	97.7 k
LL Reaction per lane (PIER)					
Truck load	65.3 k	62.0 k	58.8 k	55.7 k	52.7 k
Lane load	79.1 k	61.8 k	53.2 k	48.0 k	44.6 k
Total Live Load (PIER)	158.2 k	124.0 k	117.6 k	111.4 k	105.4 k
Total Load					
Superstructure Load (END BENT)	634.4 k	481.7 k	404.5 k	368.7 k	342.6 k
Superstructure Load (PIER)	932.0 k	608.0 k	462.5 k	399.6 k	355.8 k
Foundation					
Maximum pile spacing	13.0 Ft.				
Service Load Capacity of Piles	**260.0 k**				
Location of Ext. pile from coping at End Bent/Pier	4.0 Ft.				
Number of Piles Required For END BENT	4	4	4	4	4
Number of Piles Required For PIER	4	4	4	4	4
Service Design Load (END BENT)	159 k	120 k	101 k	92 k	86 k
Service Design Load (PIER)	233 k	152 k	116 k	100 k	89 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

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November 29, 2000

Alternative 3 (Bridge 4)

FOUNDATION LOADS on DRILLED SHAFT

L:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 3\[Type F Bridge 4.xls]COST

Bridge Width 35.08 Ft. | Number of lanes 2 | Number of Florida Double Tee = 5

Number of Spans	2 spans	3 spans	4 spans	5 spans	6 spans
Beam Type	IV	III	II	II	II
Beam Weight (k/ft)	0.822 klf	0.583 klf	0.384 klf	0.384 klf	0.384 klf
Number of Beams	4 beams	4 beams	4 beams	4 beams	4 beams
Span Length (ft)	83.50 Ft.	56.67 Ft.	43.25 Ft.	35.20 Ft.	29.83 Ft.
Beam Span (ft)	81.50 Ft.	54.67 Ft.	41.25 Ft.	33.20 Ft.	27.83 Ft.
Bridge Deck Thickness (in)	8.00 in.	8.00 in.	8.00 in.	8.00 in.	8.00 in.
Comp. Loads (ksf)	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf	0.035 ksf
Barrier Loads (k/ft)(both sides)	0.836 klf	0.836 klf	0.836 klf	0.836 klf	0.836 klf
Dead Load					
Beam Load (End Bent)	365.4 k	220.9 k	151.4 k	123.2 k	104.4 k
Beam Load (Pier)	730.8 k	441.8 k	302.8 k	246.4 k	208.8 k
Live Load					
Reduction factor	1.0				
Impact factor for Substructure	1.0				
LL Reaction per lane (END BENT)					
Truck load	64.0 k	60.1 k	56.5 k	52.9 k	49.5 k
Lane load	52.7 k	44.1 k	39.8 k	37.3 k	35.5 k
Total Live Load (END BENT)	127.9 k	120.3 k	112.9 k	105.8 k	98.9 k
LL Reaction per lane (PIER)					
Truck load	65.3 k	62.1 k	59.1 k	56.1 k	53.2 k
Lane load	79.4 k	62.3 k	53.7 k	48.5 k	45.1 k
Total Live Load (PIER)	158.9 k	124.5 k	118.1 k	112.2 k	106.5 k
Total Load					
Superstructure Load (END BENT)	660.4 k	508.3 k	431.4 k	396.1 k	370.5 k
Superstructure Load (PIER)	952.9 k	629.5 k	484.0 k	421.7 k	378.5 k
Foundation					
Maximum pile spacing	16.0 Ft.				
Location of Ext. shaft from coping at End Bent	6.0 Ft.				
Number of Piles Required For END BENT	3	3	3	3	3
Number of Piles Required For PIER	2	2	2	2	2
Service Design Load (END BENT)	220 k	169 k	144 k	132 k	123 k
Service Design Load (PIER)	476 k	315 k	242 k	211 k	189 k

Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

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Alternative 3 (Bridge 4)

INTERMEDIATE BENTS / PIERS

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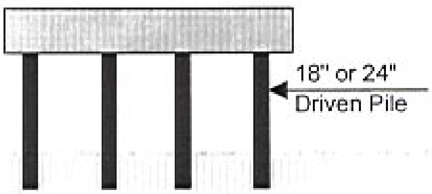
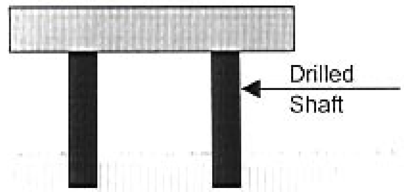
November 29, 2000



Intermediate Bent Section



Pier Section
(2 Drilled Shafts)

Foundation Type	18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length	19 ft.	19 ft.	14 ft.
Pile Length Above Ground	8 ft.	8 ft.	8 ft.
Total Length of Pile	27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft	**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area	9.0 sq.ft	9.0 sq.ft	12.0 sq.ft
Bent Cap Length	35 ft.	35 ft.	35 ft.
Total Concrete Volume	11.7 CY	11.7 CY	15.6 CY
Reinforcement at 145 lbs/CY	1696 lbs	1696 lbs	2261 lbs
Estimated Cost of Bent Cap	**$5,616**	**$5,616**	**$7,488**

PRESTRESSED PILES	18 in.	24 in.	**DRILLED SHAFT**	36 in.
Number of test loads per bridge	2 ea.	2 ea.	Number of test loads per bridge	1 ea.
			Core (Shaft Excavation)	
			Length of temporary casing	
Est. total cost of test piles w/ dynamic load test per bridge	$13,440	$13,440	% of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% of pile hole preformed	100%	100%	Excavation, unclassified extra depth	

Number of Spans	Number of Piles Required 18 in.	Number of Piles Required 24 in.	Number of Drilled Shafts 36 in.	Total Cost of Piles per Bent / Pier 18" Pile	Total Cost of Piles per Bent / Pier 24" Pile	Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier 18" Pile	Total Estimated Cost of ONE Pier 24" Pile	Total Estimated Cost of ONE Pier 36" Shaft
2	7	4	2	$21,154	$19,276	$59,680	$26,770	$24,892	$67,168
3	5	4	2	$12,230	$12,556	$34,680	$17,846	$18,172	$42,168
4	4	4	2	$8,888	$10,316	$26,347	$14,504	$15,932	$33,835
5	4	4	2	$7,768	$9,196	$22,180	$13,384	$14,812	$29,668
6	4	4	2	$7,096	$8,524	$19,680	$12,712	$14,140	$27,168

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: M. LeComte
Alternative 3 (Bridge 4)	END BENTS	Checked by: C. Li
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-3\[Type F Bridge 4.xls]COST		November 29, 2000

Foundation Type		18 in. Pile	24 in. Pile	36 in. Shaft
Estimated Pile Embedment Length		19 ft.	19 ft.	14 ft.
Pile Length Above Ground		8 ft.	8 ft.	8 ft.
Total Length of Pile		27 ft.	27 ft.	22 ft.
Estimated Cost of One Pile/Drilled Shaft		**$891**	**$1,242**	**$4,840**
Bent cap cross sectional area		7.5 sq.ft	7.5 sq.ft	12.0 sq.ft
Bent Cap Length		35 ft.	35 ft.	35 ft.
Total Concrete Volume		9.7 CY	9.7 CY	15.6 CY
Reinforcement at	145 lbs/CY	1413 lbs	1413 lbs	2261 lbs
Estimated Cost of Bent Cap		**$4,680**	**$4,680**	**$7,488**

PRESTRESSED PILES	18 in.	24 in.	DRILLED SHAFTS	36 in.
			Core(Shaft Excavation)	
			Length of temporary casing	
			Percentage of casing splice	
			Excavation, unclassified shaft	
% of pile splice	10%	10%	Drilled shaft sidewall overreaming	
% Pile hole preformed	100%	100%	xcavation, unclassified extra depth	

Number of Spans	Number of Piles Required[1] 18 in.	Number of Piles Required[1] 24 in.	Number of Drilled Shafts[2] 36 in.	Total Cost of Piles per Bent / Pier 18" Pile	Total Cost of Piles per Bent / Pier 24" Pile	Total Cost of Drilled Shaft per Pier	Total Estimated Cost of ONE Pier 18" Pile	Total Estimated Cost of ONE Pier 24" Pile	Total Estimated Cost of ONE Pier 36" Shaft
2	7	6	5	$7,714	$8,754	$24,200	$25,103	$26,143	$44,397
3	6	6	5	$6,612	$8,754	$24,200	$21,440	$23,582	$41,836
4	6	6	5	$6,612	$8,754	$24,200	$19,120	$21,262	$39,516
5	6	6	5	$6,612	$8,754	$24,200	$19,120	$21,262	$39,516
6	6	6	5	$6,612	$8,754	$24,200	$19,120	$21,262	$39,516

[1]Includes wingwall piles for Type IV, III, II beams.

[2]Includes wingwall drilled shafts for Type IV, III, II beams.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	PBS&J Done by: M. LeComte
Alternative 3 (Bridge 4) — **SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISON**	Checked by: C. Li
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Number of Spans	ADJUSTED SPAN LENGTH 18 in. Pile	24 in. Pile	36 in. Shaft	Number of Piers	Cost of Substructure 18 in. Pile	24 in. Pile	36 in. Shaft	Cost of Superstructure 18 in. Pile	24 in. Pile	36 in. Shaft	Total Cost of Structure 18 in. Pile	24 in. Pile	36 in. Shaft
2	82.75 Ft.	83.00 Ft.	83.50 Ft.	1	$76,976	$77,178	$155,962	$113,277	$113,619	$114,303	$190,252	$190,796	$270,265
3	55.67 Ft.	56.00 Ft.	56.67 Ft.	2	$78,572	$83,508	$168,008	$102,947	$103,564	$104,797	$181,519	$187,072	$272,805
4	42.13 Ft.	42.50 Ft.	43.25 Ft.	3	$81,752	$90,320	$180,537	$95,110	$95,957	$97,650	$176,862	$186,277	$278,187
5	34.00 Ft.	34.40 Ft.	35.20 Ft.	4	$91,777	$101,773	$197,705	$95,957	$97,086	$99,343	$187,733	$198,858	$297,049
6	28.58 Ft.	29.00 Ft.	29.83 Ft.	5	$101,801	$113,225	$214,874	$96,803	$98,214	$101,037	$198,604	$211,439	$315,910

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

Number of Spans	Estimated Cost	Foundation Alternative	Superstructure Alternative	Number of Spans	Number of Beams	Number of Piles or Drilled Shafts	Total Length of Piles or Drilled Shafts	Number of Test Piles	Total Length of Test Piles
2	$190,252	18 in.	Type IV	2	4	19	513 ft	2	84 ft
3	$181,519	18 in.	Type III	3	4	20	540 ft	2	84 ft
4	$176,862	18 in.	Type II	4	4	22	594 ft	2	84 ft
5	$187,733	18 in.	Type II	5	4	26	702 ft	2	84 ft
6	$198,604	18 in.	Type II	6	4	30	810 ft	2	84 ft

$176,862 <--- Minimum

RESULT OF COST COMPARISON STUDY:

Most economical superstructure type: Type II
Most economical substructure type: 18 in.
Optimum Span Arrangement: 4 spans at 42.13 FT.
Total bridge length: 168.50 Ft.
Total number of beams: 16
Total length of beams: 674.00 Ft.
Number of piles or drilled Shafts: 22
Length of Piles or drilled Shafts: 594.00 Ft.

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBS&J Done by: M. LeComte
Alternative 3 (Bridge 4)	**ESTIMATE OF PROBABLE CONSTRUCTION COSTS**	Checked by: C. Li
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Item	Quantity	Units	Unit Price	Amount
SUPERSTRUCTURE:				
Concrete	146.0	CY	$310	$45,271
Reinforcing Steel[1]	29938	LBS	$0.45	$13,472
Bridge Floor Grooving	599	SY	$2.50	$1,498
Traffic Railing Barrier	337.0	FT	$35	$11,795
Expansion Joints[3]	70.2	FT	$84	$5,894
Type II Beam	674.0	FT	$54	$36,396
Neoprene Bearing Pads	3.501	CY	$425	$1,488
			Superstructure Subtotal	$115,814
SUBSTRUCTURE:				
Concrete	87.0	CY	$415	$36,113
Reinforcing Steel[2]	12618	LBS	$0.45	$5,678
Pile Hole, Preformed	22	EA	$200	$4,400
Test Piles	84	Ft.	$160	$13,440
18 in. Prestressed Concrete Piles (F & I)	594	Ft.	$33	$19,602
Pile Splices	3	EA	$110	$330
Drilled shaft		LF	$220	
Test load for drilled shaft		EA	$50,000	
Core (Shaft Excavation)		LF		
Temporary casing		LF		
Casing splice		EA		
Excavation, unclassified shaft		LF		
Drilled shaft sidewall overreaming		LF		
Excavation, unclassified extra depth		LF		
			Substructure Subtotal	$79,563
			Construction Cost Subtotal	**$195,377**
Mobilization (5% of Construction Cost)	1	LS		$ 9,769
Contingency (15% of Construction Cost)	1	LS		$ 29,307
			Total Construction Cost	**$234,453**
			Deck Square Footage (Ft.)	5,912
			Cost Per Square Foot	**$39.66/sf**

[1]Ratio of reinforcement to superstructure concrete: 205 Lbs/CY.

[2]Ratio of reinforcement to substructure concrete: 145 Lbs/CY.

[3]Number of expansion piers: 2

PBSJ	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	BRIDGE AND SPAN LENGTHS	Design: FO Date: 11/29/00 Checked: CL Date: 11/29/00

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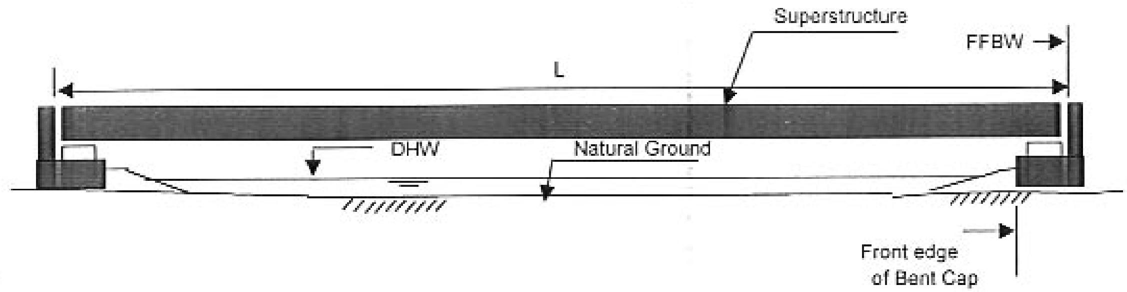
Alternative 3 (Bridges 5 & 6)



Bridge Length L: **1200** Ft.
Minimum Span length 85 Ft.
Increaments of number of spans 1

NO. OF	ADJUSTED BRIDGE LENGTH(FT.)			ADJUSTED SPAN LENGTH (FT.)		
SPANS	18 PILE	24 PILE	36 DRILLED SHAFT	18 PILE	24 PILE	36 DRILLED SHAFT
8	1200	1200	1200	150.0	150.0	150.0
9	1200	1200	1200	133.3	133.3	133.3
10	1200	1200	1200	120.0	120.0	120.0
11	1200	1200	1200	109.1	109.1	109.1
12	1200	1200	1200	100.0	100.0	100.0
13	1200	1200	1200	92.3	92.3	92.3
14	1200	1200	1200	85.7	85.7	85.7

LENGTH

PBSJ	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	BEAM SPACING VS DESIGN SPAN	Design: FO Date: 11/29/00 Checked: CL Date: 11/29/00

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<u>Alternative 3 (Bridges 5 & 6)</u>

BRIDGE WIDTH: 43.083 Ft. SLAB THICK: 8.5 In.

NUMBER OF BEAMS	* BEAM SPACING	** DESIGN SPAN (AASHTO BEAMS)			
		TYPE V	TYPE VI	FBT72	FBT78
4	10.77	108.5	126.0	114.0	118.0
5	8.62	115.5	135.0	124.0	128.0
6	7.18	120.5	141.0	132.0	138.0
7	6.15	125.0	146.0	137.0	145.0
8	5.39	128.0	150.0	143.0	152.0

* <u>Based on Cantilever being half of the beam spacing.</u>

** Design spans are determined from the charts based on the beam spacing given.

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Tamiami Trail Modified Water Deliveries to Everglades National Park Project

Preparation of Engineering Appendix For GRR / SEIS
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AASHTO BEAMS COMPARISON

Sheet ____ of ____

Design: FO Date: 07/11/00
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Alternative 3 (Bridges 5 & 6)

NUMBER OF SPANS	ADJUSTED SPAN LENGTH (FT.)			NUMBER OF AASHTO BEAMS											
	PILES		DRILLED SHAFT	18" PILES				24" PILES				DRILLED SHAFT			
	18 IN.	24 IN.		V	VI	FBT72	FBT78	V	VI	FBT72	FBT78	V	VI	FBT72	FBT78
8	150.0	150.0	150.0		8		8		8		8		8		8
9	133.3	133.3	133.3		5	7	6		5	7	6		5	7	6
10	120.0	120.0	120.0	6	4	5	5	6	4	5	5	6	4	5	5
11	109.1	109.1	109.1	5	4	4	4	5	4	4	4	5	4	4	4
12	100.0	100.0	100.0	4	4	4	4	4	4	4	4	4	4	4	4
13	92.3	92.3	92.3	4	4	4	4	4	4	4	4	4	4	4	4
14	85.7	85.7	85.7	4	4	4	4	4	4	4	4	4	4	4	4

NUMBER OF SPANS	ESTIMATED CONSTRUCTION COST OF AASHTO BEAMS											
	18" PILES				24" PILES				DRILLED SHAFT			
	V	VI	FBT72	FBT78	V	VI	FBT72	FBT78	V	VI	FBT72	FBT78
8	N/A	$1,056,000	N/A	1056000	N/A	$1,056,000	N/A	1056000	N/A	$1,056,000	N/A	1056000
9	N/A	$660,000	$814,800	792000	N/A	$660,000	$814,800	792000	N/A	$660,000	$814,800	792000
10	$662,400	$528,000	$582,000	660000	$662,400	$528,000	$582,000	660000	$662,400	$528,000	$582,000	660000
11	$552,000	$528,000	$465,600	528000	$552,000	$528,000	$465,600	528000	$552,000	$528,000	$465,600	528000
12	$441,600	$528,000	$465,600	528000	$441,600	$528,000	$465,600	528000	$441,600	$528,000	$465,600	528000
13	$441,600	$528,000	$465,600	528000	$441,600	$528,000	$465,600	528000	$441,600	$528,000	$465,600	528000
14	$441,600	$528,000	$465,600	528000	$441,600	$528,000	$465,600	528000	$441,600	$528,000	$465,600	528000
Beam Unit Price:	$92.00	$110.00	$97.00	110.00	$92.00	$110.00	$97.00	110.00	$92.00	$110.00	$97.00	110.00

NUMBER OF SPANS	MOST ECONOMICAL AASHTO BEAM TYPE					
	18" PILES		24" PILES		DRILLED SHAFT	
	TYPE	COST	TYPE	COST	TYPE	COST
8	VI	$1,056,000	VI	$1,056,000	VI	$1,056,000
9	VI	$660,000	VI	$660,000	VI	$660,000
10	VI	$528,000	VI	$528,000	VI	$528,000
11	FBT72	$465,600	FBT72	$465,600	FBT72	$465,600
12	V	$441,600	V	$441,600	V	$441,600
13	V	$441,600	V	$441,600	V	$441,600
14	V	$441,600	V	$441,600	V	$441,600

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Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

SUPERSTRUCTURE ALTERNATIVES COMPARISION

Sheet ____ of ____
Design: FO Date 11/29/00
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Alternative 3 (Bridges 5 & 6)

SPAN NUMBER	ADJUSTED SPAN LENGTH (FT.)			COST OF BEAMS & DECK SLAB						BEAM NUMBERS		
	FOR 18" PILES	FOR 24" PILES	FOR DRILLED SHAFT	FOR 18" PILES		FOR 24" PILES		FOR DRILLED SHAFT		18 IN. PILES	24 IN. PILES	DRILLED SHAFT
				TYPE	COST	TYPE	COST	TYPE	COST			
8	150.0	150.0	150.0	VI	$1,601,578	VI	$1,601,578	VI	$1,601,578	8	8	8
9	133.3	133.3	133.3	VI	$1,205,578	VI	$1,205,578	VI	$1,205,578	5	5	5
10	120.0	120.0	120.0	VI	$1,073,578	VI	$1,073,578	VI	$1,073,578	4	4	4
11	109.1	109.1	109.1	FBT72	$1,011,178	FBT72	$1,011,178	FBT72	$1,011,178	4	4	4
12	100.0	100.0	100.0	V	$987,178	V	$987,178	V	$987,178	4	4	4
13	92.3	92.3	92.3	V	$987,178	V	$987,178	V	$987,178	4	4	4
14	85.7	85.7	85.7	V	$987,178	V	$987,178	V	$987,178	4	4	4

Deck Reinforcement 205 Lbs/CY of Concrete
Cost of Deck/Feet $455

FOUNDATION LOADS AND NUMBER OF 18 IN. PRESTRESSED PILES

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Alternative 3 (Bridges 5 & 6)

Bridge Width (ft)	43.083						
Number of lanes	3						
Beam Type	VI	VI	VI	FBT72	V	V	V
Beam Weight (k/ft)	1.130	1.130	1.130	0.800	1.055	1.055	1.055
Number of Spans	8	9	10	11	12	13	14
Number of Beams	8	5	4	4	4	4	4
Span Length (ft)	150.0	133.3	120.0	109.1	100.0	92.3	85.7
Beam Span (ft)	148.0	131.3	118.0	107.1	98.0	90.3	83.7
Bridge Deck Thickness (in)	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Comp. Loads (ksf)	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Barrier Loads (k/ft)(both sides)	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Dead Load							
Beam Load (kips) (END BENT)	1144.0	790.9	644.0	513.5	521.7	481.5	447.2
Beam Load (kips) (PIER)	2288.0	1581.8	1288.0	1026.9	1043.4	963.1	894.3
Live Load							
Reduction factor	0.9						
Impact factor for Substructure	1.0						
LL Reaction per lane (END BENT)							
Truck load (kips)	67.52	66.96	66.40	65.84	65.28	64.72	64.16
Lane load (kips)	74.00	68.67	64.40	60.91	58.00	55.54	53.43
Total Live Load (kips) (END BENT)	199.8	185.4	179.3	177.8	176.3	174.7	173.2
LL Reaction per lane (PIER)							
Truck load (kips)	68.27	67.80	67.33	66.87	66.40	65.93	65.47
Lane load (kips)	122.00	111.33	102.80	95.82	90.00	85.08	80.86
Total Live Load (kips) (PIER)	329.4	300.6	277.6	258.7	243.0	229.7	218.3
Total Load							
Superstructure Load (kips) (END BENT)	1437.5	1070.0	917.0	784.9	791.6	750.0	714.1
Superstructure Load (kips) (PIER)	2675.6	1940.6	1623.8	1343.8	1344.5	1251.0	1170.8
Foundation							
Maximum pile spacing (ft)	13.0						
Service Load Capacity of Piles (kips)	147.0						
** Number of Piles Reqd For END BENT	N/A	8.0	7.0	6.0	6.0	6.0	5.0
** Number of Piles Reqd For PIER	N/A	N/A	N/A	N/A	N/A	9.0	8.0
Service Design Load (kips)(END BENT)	N/A	134	131	131	132	125	143
Service Design Load (kips)(PIER)	N/A	N/A	N/A	N/A	N/A	139	146

** NOTE: N/A indicates that required number of piles exceeds the max. number of piles based on minimum pile spacing (3 * pile size).

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	FOUNDATION LOADS AND NUMBER OF 24 IN. PRESTRESSED PILES	Design: SY Date: 11/29/00 Checked: CL Date: 11/29/00

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Alternative 3 (Bridges 5 & 6)

Bridge Width (ft)	43.083						
Number of lanes	3						
Beam Type	VI	VI	VI	FBT72	V	V	V
Beam Weight (k/ft)	1.130	1.130	1.130	0.800	1.055	1.055	1.055
Number of Spans	8	9	10	11	12	13	14
Number of Beams	8	5	4	4	4	4	4
Span Length (ft)	150.0	133.3	120.0	109.1	100.0	92.3	85.7
Beam Span (ft)	148.0	131.3	118.0	107.1	98.0	90.3	83.7
Bridge Deck Thickness (in)	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Comp. Loads (ksf)	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Barrier Loads (k/ft)(both sides)	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Dead Load							
Beam Load (kips) (END BENT)	1144.0	790.9	644.0	513.5	521.7	481.5	447.2
Beam Load (kips) (PIER)	2288.0	1581.8	1288.0	1026.9	1043.4	963.1	894.3
Live Load							
Reduction factor	0.9						
Impact factor for Substructure	1.0						
LL Reaction per lane (END BENT)							
Truck load (kips)	67.52	66.96	66.40	65.84	65.28	64.72	64.16
Lane load (kips)	74.00	68.67	64.40	60.91	58.00	55.54	53.43
Total Live Load (kips) (END BENT)	199.8	185.4	179.3	177.8	176.3	174.7	173.2
LL Reaction per lane (PIER)							
Truck load (kips)	68.27	67.80	67.33	66.87	66.40	65.93	65.47
Lane load (kips)	122.00	111.33	102.80	95.82	90.00	85.08	80.86
Total Live Load (kips) (PIER)	329.4	300.6	277.6	258.7	243.0	229.7	218.3
Total Load							
Superstructure Load (kips) (END BENT)	1437.5	1070.0	917.0	784.9	791.6	750.0	714.1
Superstructure Load (kips) (PIER)	2675.6	1940.6	1623.8	1343.8	1344.5	1251.0	1170.8
Foundation							
Maximum pile spacing (ft)	13.0						
Service Load Capacity of Piles (kips)	260.0						
** Number of Piles Reqd For END BENT	6.0	5.0	4.0	4.0	4.0	4.0	4.0
** Number of Piles Reqd For PIER	N/A	N/A	7.0	6.0	6.0	5.0	5.0
Service Design Load (kips)(END BENT)	240	214	229	196	198	187	179
Service Design Load (kips)(PIER)	N/A	N/A	232	224	224	250	234

** NOTE: N/A indicates that required number of piles exceeds the max. number of piles based on minimum pile spacing (3 * pile size).

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Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

FOUNDATION LOADS ON DRILLED SHAFT

Sheet ____ of ____
Design: SY Date: 11/29/00
Checked: CL Date: 11/29/00

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Alternative 3 (Bridges 5 & 6)

Bridge Width (ft)	43.083						
Number of lanes	3						
Beam Type	VI	VI	VI	FBT72	V	V	V
Beam Weight (k/ft)	1.130	1.130	1.130	0.800	1.055	1.055	1.055
Number of Spans	8	9	10	11	12	13	14
Number of Beams	8	5	4	4	4	4	4
Span Length (ft)	150.0	133.3	120.0	109.1	100.0	92.3	85.7
Beam Span (ft)	148.0	131.3	118.0	107.1	98.0	90.3	83.7
Bridge Deck Thickness (in)	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Comp. Loads (ksf)	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Barrier Loads (k/ft)(both sides)	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Dead Load							
Beam Load (kips) (END BENT)	1144.0	790.9	644.0	513.5	521.7	481.5	447.2
Beam Load (kips) (PIER)	2288.0	1581.8	1288.0	1026.9	1043.4	963.1	894.3
Live Load							
Reduction factor	0.9						
Impact factor for Substructure	1.0						
LL Reaction per lane (END BENT)							
Truck load (kips)	67.52	66.96	66.40	65.84	65.28	64.72	64.16
Lane load (kips)	74.00	68.67	64.40	60.91	58.00	55.54	53.43
Total Live Load (kips) (END BENT)	199.8	185.4	179.3	177.8	176.3	174.7	173.2
LL Reaction per lane (PIER)							
Truck load (kips)	68.27	67.80	67.33	66.87	66.40	65.93	65.47
Lane load (kips)	122.00	111.33	102.80	95.82	90.00	85.08	80.86
Total Live Load (kips) (PIER)	329.4	300.6	277.6	258.7	243.0	229.7	218.3
Total Load							
* Superstructure Load (kips) (END BENT)	1466.6	1099.1	946.1	814.0	820.7	779.1	743.2
* Superstructure Load (kips) (PIER)	2695.0	1960.0	1643.1	1363.2	1363.9	1270.4	1190.2
Foundation							
Maximum pile spacing (ft)	16.0						
Cantilever dist. from shaft to coping (ft)	6.0						
Number of Piles Required For END BENT	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Number of Piles Required For PIER	2	2	2	2	2	2	2
Service Design Load (kips)(END BENT)	489	366	315	271	274	260	248
Service Design Load (kips)(PIER)	1347	980	822	682	682	635	595

INTERMEDIATE BENTS / PIERS

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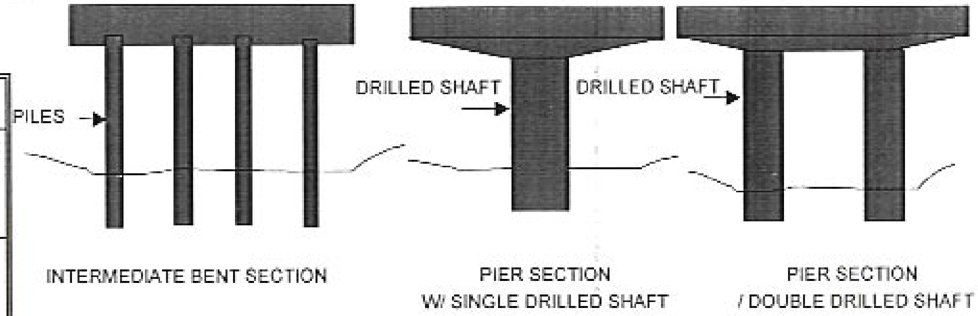
Alternative 3 (Bridges 5 & 6)

Pile Dia.(Inches)	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
Estimated Pile Embedment Length(Ft.)	19	19	21
Pile Length Above Ground(Ft.)	8	8	8
Total Length of Pile (Ft.)	27	27	29
Estimated Cost of One Pile/Drilled Shaft	$891	$1,242	$6,380
BentCap X-section (SqFt.)	9	9	12
Bent Length(Ft.)	43.083	43.083	43.083
Total Concrete Volume(CY.)	14.36	14.36	19.15
Reinforcement(Lbs) *	2082	2082	2776
ESTIMATED COST OF BENT CAP	$6,897	$6,897	$9,196



* 145 Lbs/CY

PRESTRESSED PILES	18 IN. PILES	24 IN. PILES
No. of test piles with dynamic load tests per bridge	6	6
Estimated total cost of test piles w/ dynamic load test per bridge	$40,320.00	$40,320.00
% of pile splice	10	10
% of pile hole preformed	100	100

DRILLED SHAFT		
No.of test load for drilled shaft per bridge	EA	1
Core(Shaft Excavation)	LF	0
Length of temporary casing	LF	0
% of casing splice	%	0
Excavation, unclassified shaft	LF	
Drilled shaft sidewall overreaming	LF	0
Excavation, unclassified extra depth	LF	0

NUMBER OF SPANS	NUMBER OF PILES		NUMBER OF DRILLED SHAFT	TOTAL COST OF PILES PER BENT		TOTAL COST OF DRILLED SHAFT PER PIER	ESTIMATED COST OF ONE BENT/PIER		
	18 IN. PILES	24 IN. PILES		18 IN. PILES	24 IN. PILES		18 IN. PILES	24 IN. PILES	DRILLED SHAFT
8	N/A	N/A	2	N/A	N/A	$19,903	N/A	N/A	$29,099
9	N/A	N/A	2	N/A	N/A	$19,010	N/A	N/A	$28,206
10	N/A	7	2	N/A	$14,693	$18,316	N/A	$21,590	$27,511
11	N/A	6	2	N/A	$12,786	$17,760	N/A	$19,683	$26,956
12	N/A	6	2	N/A	$12,419	$17,305	N/A	$19,316	$26,501
13	9	5	2	$13,278	$10,655	$16,927	$20,175	$17,552	$26,122
14	8	5	2	$11,918	$10,397	$16,606	$18,814	$17,293	$25,802

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ___ of 2
	END BENTS	Design: FO Date: 11/29/00 Checked: CL Date: 11/29/00

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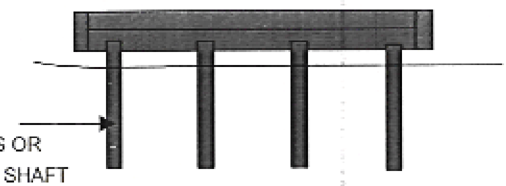
Alternative 3 (Bridges 5 & 6)

Pile Dia.(Inches)	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
Estimated Pile Embedment Length(Ft.)	19	19	21
Pile Length Above Ground(Ft.)	8	8	8
Total Length of Pile (Ft.)	27	27	29
Estimated Cost of One Pile/Drilled Shaft	$891	$1,242	$6,380
End BentCap X-section (SqFt.)	7.5	7.5	12
End Bent Length(Ft.)	43.083	43.083	43.083
Total Concrete Volume(CY.)	11.97	11.97	19.15
Reinforcement(Lbs) *	1735	1735	2776
ESTIMATED COST OF BENT CAP	$5,747	$5,747	$9,196



* 145 Lbs/CY

	PRESTRESSED PILES		DRILLED SHAFTS		
	18 IN. PILES	24 IN. PILES	Core(Shaft Excavation)	LF	0
			Length of temporary casing	LF	0
			%'age of casing splice	%	0
			Excavation, unclassified shaft	LF	
% of pile splice	10	10	Drilled shaft sidewall overreaming	LF	0
% Pile hole preformed	100	100	Excavation, unclassified extra depth	LF	

NUMBER OF SPANS	* NUMBER OF PILES		** NUMBER OF	TOTAL COST OF PILES PER ENDBENT		TOTAL COST OF DRILLED SHAFT PER	ESTIMATED COST OF ONE ENDBENT		
	18 IN. PILES	24 IN. PILES	DRILLED SHAFT	18 IN. PILES	24 IN. PILES	ENDBENT **	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
8	N/A	6	5	N/A	$8,754	$31,900	N/A	$31,327	$57,921
9	10	5	5	$11,020	$7,295	$31,900	$33,593	$29,868	$57,921
10	9	4	5	$9,918	$5,836	$31,900	$32,491	$28,409	$57,921
11	8	4	5	$8,816	$5,836	$31,900	$31,389	$28,409	$57,921
12	8	4	5	$8,816	$5,836	$31,900	$28,791	$25,811	$55,324
13	8	4	5	$8,816	$5,836	$31,900	$28,791	$25,811	$55,324
14	7	4	5	$7,714	$5,836	$31,900	$27,689	$25,811	$55,324

* Includes 2 wingwall piles for all beam types

** Includes 2 wingwall drilled shafts for all beam types

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISION	Design: FO Date 11/29/00 Checked CL Date 11/29/00

Alternative 3 (Bridges 5 & 6)

SPAN NUMBER	ADJUSTED SPAN LENGTH (FT.)			NO. OF PIERS	COST OF SUBSTRUCTURE			COST OF SUPER STRUCTURE			TOTAL COST OF STRUCTURE		
	18 IN. PILES	24 IN. PILES	DRILLED SHAFT		18 IN. PILES	24 IN. PILES	DRILLED SHAFT	18 IN. PILES	24 IN. PILES	DRILLED SHAFT	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
8	150.0	150.0	150.0	7	N/A	N/A	$319,534	$1,601,578	$1,601,578	$1,601,578	N/A	N/A	$1,921,112
9	133.3	133.3	133.3	8	N/A	N/A	$341,490	$1,205,578	$1,205,578	$1,205,578	N/A	N/A	$1,547,068
10	120.0	120.0	120.0	9	N/A	$251,127	$363,445	$1,073,578	$1,073,578	$1,073,578	N/A	$1,324,705	$1,437,024
11	109.1	109.1	109.1	10	N/A	$253,647	$385,401	$1,011,178	$1,011,178	$1,011,178	N/A	$1,264,825	$1,396,580
12	100.0	100.0	100.0	11	N/A	$264,102	$402,161	$987,178	$987,178	$987,178	N/A	$1,251,280	$1,389,340
13	92.3	92.3	92.3	12	$299,681	$262,245	$424,117	$987,178	$987,178	$987,178	$1,286,859	$1,249,423	$1,411,295
14	85.7	85.7	85.7	13	$299,966	$276,437	$446,073	$987,178	$987,178	$987,178	$1,287,144	$1,263,615	$1,433,251

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

COST	FOUNDATION ALTERNATIVE	SUPERSTR. ALTERNATIVE	CORRESPONDING NUMBER OF SPANS	NUMBER OF BEAMS	NUMBER OF PILES OR DRILLED SHAFT	TOTAL LENGTH OF PILES OR DRILLED SHAFT (FT.)	NUMBER OF TEST PILES	TOTAL LENGTH OF TEST PILES (FT.)
$1,921,112	DRILLED SHAFT	VI	8	8	24	696	0	0
$1,547,068	DRILLED SHAFT	VI	9	5	26	754	0	0
$1,324,705	24 IN. PILES	VI	10	4	65	1755	6	252
$1,264,825	24 IN. PILES	FBT72	11	4	62	1674	6	252
$1,251,280	24 IN. PILES	V	12	4	68	1836	6	252
$1,249,423	24 IN. PILES	V	13	4	62	1674	6	252
$1,263,615	24 IN. PILES	V	14	4	67	1809	6	252

$1,249,423 <--- Minimum

RESULT OF COST COMPARISON STUDY:

MOST ECONOMICAL SUPERSTRUCTURE TYPE:	V		
MOST ECONOMICAL SUBSTRUCTURE TYPE:	24 IN. PILES		
OPTIMUM SPAN ARRANGEMENT	13	SPANS AT	92.31 FT.
TOTAL BRIDGE LENGTH:	1200 FT.		
TOTAL NUMBER OF BEAMS:	52		
TOTAL BEAM LENGTH:	4800 FT.		
NUMBER OF PILES OR DRILLED SHAFT	62		
LENGTH OF PILES OR DRILLED SHAFT:	1674 FT.		

PBSJ	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet of
	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Design: FO Date: 11/29/00 Checked: CL Date: 11/29/00

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Alternative 3 (Bridges 5 & 6)

ITEM	QUANTITY	UNITS	UNIT PRICE	AMOUNT
SUPERSTRUCTURE:				
Class II Concrete -- (Superstructure)	1356.3	CY	$310.00	$420,458
Reinforcing Steel -- (Superstructure)*	278045	LBS	$0.45	$125,120
Bridge Floor Grooving	5333	SY	$2.50	$13,333
Traffic Railing Barrier	2400.0	FT	$35.00	$84,000
Expansion Joints***	215.4	FT	$84.00	$18,095
AASHTO Beam, Type V	4800.0	FT	$92.00	$441,600
Neoprene Bearing Pads	29.120	CY	$425.00	$12,376
		Superstructure Subtotal		$1,114,983
SUBSTRUCTURE:				
Class II Concrete -- (Substructure)	255.2	CY	$415.00	$105,925
Reinforcing Steel -- (Substructure)**	37010	LBS	$0.45	$16,655
Pile Hole, Preformed	62	EA	$200.00	$12,400
Test Piles	252	Ft.	$160.00	$40,320
Prestressed Concrete Piles (F & I)	1674	Ft.	$46.00	$77,004
Pile Splices	7	EA	$170.00	$1,190
Drilled shaft	0	LF	$220.00	$0
Test load for drilled shaft	0	EA	$50,000.00	$0
Core(Shaft Excavation)	0	LF	$0.00	$0
Temporary casing	0	LF	$0.00	$0
Casing splice	0	EA	$0.00	$0
Excavation, unclassified shaft	0	LF	$0.00	$0
Drilled shaft sidewall overreaming	0	LF	$0.00	$0
Excavation, unclassified extra depth	0	LF	$0.00	$0
		Substructure Subtotal		$253,494
		Construction Cost Subtotal		**$1,368,477**
Mobilization (5% of Construction Cost)	1	LS		$68,424
Contingency (15% of Construction Cost)	1	LS		$205,271.49
		Total Construction Cost		**$1,642,172**
		Deck Square Footage (Ft.)		51,700
		Cost Per Square Foot		**$31.76**

*RATIO REBAR:CONC. (SUPERSTRUCTURE):	205	Lbs/CY.
**RATIO REBAR:CONC. (SUBSTRUCTURE):	145	Lbs/CY.
***NO.OF EXPANSION PIERS:	5	

Appendix D-6 **Alternative 5**

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	BRIDGE AND SPAN LENGTHS	Design. FO Date: 11/29/00 Checked. CL Date: 11/29/00

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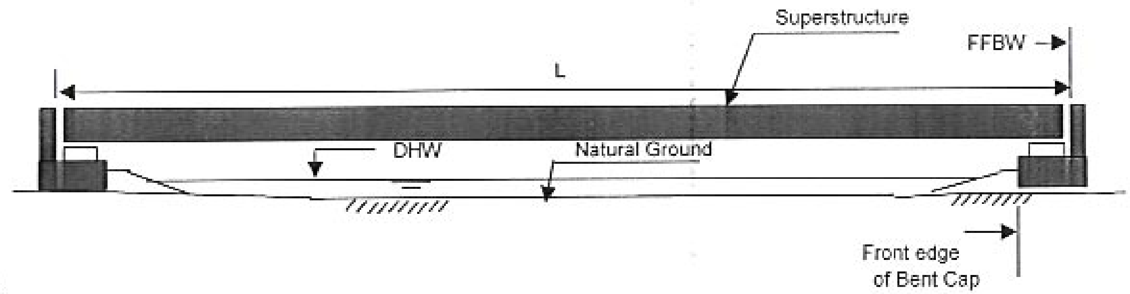
Alternative 5



Bridge Length	L: **59220**	Ft.
Minimum Span length	100	Ft.
Increaments of number of spans	15	

NO. OF SPANS	ADJUSTED BRIDGE LENGTH(FT.)			ADJUSTED SPAN LENGTH (FT.)		
	18 PILE	24 PILE	36 DRILLED SHAFT	18 PILE	24 PILE	36 DRILLED SHAFT
390	59220	59220	59220	151.8	151.8	151.8
405	59220	59220	59220	146.2	146.2	146.2
420	59220	59220	59220	141.0	141.0	141.0
435	59220	59220	59220	136.1	136.1	136.1
450	59220	59220	59220	131.6	131.6	131.6
465	59220	59220	59220	127.4	127.4	127.4
480	59220	59220	59220	123.4	123.4	123.4
495	59220	59220	59220	119.6	119.6	119.6
510	59220	59220	59220	116.1	116.1	116.1
525	59220	59220	59220	112.8	112.8	112.8
540	59220	59220	59220	109.7	109.7	109.7
555	59220	59220	59220	106.7	106.7	106.7
570	59220	59220	59220	103.9	103.9	103.9
585	59220	59220	59220	101.2	101.2	101.2

LENGTH

PBSJ	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	BEAM SPACING VS DESIGN SPAN	Design: FO Date: 11/29/00 Checked: CL Date: 11/29/00

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Alternative 5

BRIDGE WIDTH: 43.083 Ft. SLAB THICK: 8.5 In.

NUMBER OF BEAMS	* BEAM SPACING	** DESIGN SPAN (AASHTO BEAMS)			
		TYPE V	TYPE VI	FBT72	FBT78
4	10.77	108.5	126.0	114.0	118.0
5	8.62	115.5	135.0	124.0	128.0
6	7.18	120.5	141.0	132.0	138.0
7	6.15	125.0	146.0	137.0	145.0
8	5.39	128.0	150.0	143.0	152.0

* Based on Cantilever being half of the beam spacing.

** Design spans are determined from the charts based on the beam spacing given.

PBSJ	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR / SEIS Corp of Engineers, Jacksonville, Florida	Sheet ___ of ___
	AASHTO BEAMS COMPARISON	Design: FO Date: 07/11/00 Checked: CL Date: 11/29/00

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-5\[Type II Bridge 1.xls]RESULT

Alternative 5

NUMBER OF SPANS	ADJUSTED SPAN LENGTH (FT.) PILES 18 IN.	24 IN.	DRILLED SHAFT	NUMBER OF AASHTO BEAMS 18" PILES V	VI	FBT72	FBT78	24" PILES V	VI	FBT72	FBT78	DRILLED SHAFT V	VI	FBT72	FBT78
390	151.8	151.8	151.8		8		8		8		8		8		8
405	146.2	146.2	146.2		8		8		8		8		8		8
420	141.0	141.0	141.0		6	8	7		6	8	7		6	8	7
435	136.1	136.1	136.1		6	7	6		6	7	6		6	7	6
450	131.6	131.6	131.6		5	6	6		5	6	6		5	6	6
465	127.4	127.4	127.4	8	5	6	5	8	5	6	5	8	5	6	5
480	123.4	123.4	123.4	7	4	5	5	7	4	5	5	7	4	5	5
495	119.6	119.6	119.6	6	4	5	5	6	4	5	5	6	4	5	5
510	116.1	116.1	116.1	6	4	5	4	6	4	5	4	6	4	5	4
525	112.8	112.8	112.8	5	4	4	4	5	4	4	4	5	4	4	4
540	109.7	109.7	109.7	5	4	4	4	5	4	4	4	5	4	4	4
555	106.7	106.7	106.7	4	4	4	4	4	4	4	4	4	4	4	4
570	103.9	103.9	103.9	4	4	4	4	4	4	4	4	4	4	4	4
585	101.2	101.2	101.2	4	4	4	4	4	4	4	4	4	4	4	4

NUMBER OF SPANS	ESTIMATED CONSTRUCTION COST OF AASHTO BEAMS 18" PILES V	VI	FBT72	FBT78	24" PILES V	VI	FBT72	FBT78	DRILLED SHAFT V	VI	FBT72	FBT78
390	N/A	$52,113,600	N/A	52113600	N/A	$52,113,600	N/A	52113600	N/A	$52,113,600	N/A	5.2E+07
405	N/A	$52,113,600	N/A	52113600	N/A	$52,113,600	N/A	52113600	N/A	$52,113,600	N/A	5.2E+07
420	N/A	$39,085,200	$45,954,720	45599400	N/A	$39,085,200	$45,954,720	45599400	N/A	$39,085,200	$45,954,720	4.6E+07
435	N/A	$39,085,200	$40,210,380	39085200	N/A	$39,085,200	$40,210,380	39085200	N/A	$39,085,200	$40,210,380	3.9E+07
450	N/A	$32,571,000	$34,466,040	39085200	N/A	$32,571,000	$34,466,040	39085200	N/A	$32,571,000	$34,466,040	3.9E+07
465	$43,585,920	$32,571,000	$34,466,040	32571000	$43,585,920	$32,571,000	$34,466,040	32571000	$43,585,920	$32,571,000	$34,466,040	3.3E+07
480	$38,137,680	$26,056,800	$28,721,700	32571000	$38,137,680	$26,056,800	$28,721,700	32571000	$38,137,680	$26,056,800	$28,721,700	3.3E+07
495	$32,689,440	$26,056,800	$28,721,700	32571000	$32,689,440	$26,056,800	$28,721,700	32571000	$32,689,440	$26,056,800	$28,721,700	3.3E+07
510	$32,689,440	$26,056,800	$28,721,700	26056800	$32,689,440	$26,056,800	$28,721,700	26056800	$32,689,440	$26,056,800	$28,721,700	2.6E+07
525	$27,241,200	$26,056,800	$22,977,360	26056800	$27,241,200	$26,056,800	$22,977,360	26056800	$27,241,200	$26,056,800	$22,977,360	2.6E+07
540	$27,241,200	$26,056,800	$22,977,360	26056800	$27,241,200	$26,056,800	$22,977,360	26056800	$27,241,200	$26,056,800	$22,977,360	2.6E+07
555	$21,792,960	$26,056,800	$22,977,360	26056800	$21,792,960	$26,056,800	$22,977,360	26056800	$21,792,960	$26,056,800	$22,977,360	2.6E+07
570	$21,792,960	$26,056,800	$22,977,360	26056800	$21,792,960	$26,056,800	$22,977,360	26056800	$21,792,960	$26,056,800	$22,977,360	2.6E+07
585	$21,792,960	$26,056,800	$22,977,360	26056800	$21,792,960	$26,056,800	$22,977,360	26056800	$21,792,960	$26,056,800	$22,977,360	2.6E+07
Beam Unit Price:	$92.00	$110.00	$97.00	110.00	$92.00	$110.00	$97.00	110.00	$92.00	$110.00	$97.00	110.00

NUMBER OF SPANS	MOST ECONOMICAL AASHTO BEAM TYPE 18" PILES TYPE	COST	24" PILES TYPE	COST	DRILLED SHAFT TYPE	COST
390	VI	$52,113,600	VI	$52,113,600	VI	$52,113,600
405	VI	$52,113,600	VI	$52,113,600	VI	$52,113,600
420	VI	$39,085,200	VI	$39,085,200	VI	$39,085,200
435	VI	$39,085,200	VI	$39,085,200	VI	$39,085,200
450	VI	$32,571,000	VI	$32,571,000	VI	$32,571,000
465	VI	$32,571,000	VI	$32,571,000	VI	$32,571,000
480	VI	$26,056,800	VI	$26,056,800	VI	$26,056,800
495	VI	$26,056,800	VI	$26,056,800	VI	$26,056,800
510	VI	$26,056,800	VI	$26,056,800	VI	$26,056,800
525	FBT72	$22,977,360	FBT72	$22,977,360	FBT72	$22,977,360
540	FBT72	$22,977,360	FBT72	$22,977,360	FBT72	$22,977,360
555	V	$21,792,960	V	$21,792,960	V	$21,792,960
570	V	$21,792,960	V	$21,792,960	V	$21,792,960
585	V	$21,792,960	V	$21,792,960	V	$21,792,960

PBSJ

Tamiami Trail Modified Water Deliveries to Everglades National Park Project

Preparation of Engineering Appendix For GRR/SEIS

Corps of Engineers, Jacksonville, Florida

SUPERSTRUCTURE ALTERNATIVES COMPARISION

Sheet ______ of ______

Design: FO Date: 11/29/00

Checked: CL Date: 11/29/00

I:\STRUCT\Design\Tamiami-Trail-design\cost-analysis\alternative-5\[Type II Bridge 1.xls]RESULT

Alternative 5

SPAN NUMBER	ADJUSTED SPAN LENGTH (FT.)			COST OF BEAMS & DECK SLAB						BEAM NUMBERS		
	FOR 18" PILES	FOR 24" PILES	FOR DRILLED SHAFT	FOR 18" PILES		FOR 24" PILES		FOR DRILLED SHAFT		18 IN. PILES	24 IN. PILES	DRILLED SHAFT
				TYPE	COST	TYPE	COST	TYPE	COST			
390	151.8	151.8	151.8	VI	$79,037,893	VI	$79,037,893	VI	$79,037,893	8	8	8
405	146.2	146.2	146.2	VI	$79,037,893	VI	$79,037,893	VI	$79,037,893	8	8	8
420	141.0	141.0	141.0	VI	$66,009,493	VI	$66,009,493	VI	$66,009,493	6	6	6
435	136.1	136.1	136.1	VI	$66,009,493	VI	$66,009,493	VI	$66,009,493	6	6	6
450	131.6	131.6	131.6	VI	$59,495,293	VI	$59,495,293	VI	$59,495,293	5	5	5
465	127.4	127.4	127.4	VI	$59,495,293	VI	$59,495,293	VI	$59,495,293	5	5	5
480	123.4	123.4	123.4	VI	$52,981,093	VI	$52,981,093	VI	$52,981,093	4	4	4
495	119.6	119.6	119.6	VI	$52,981,093	VI	$52,981,093	VI	$52,981,093	4	4	4
510	116.1	116.1	116.1	VI	$52,981,093	VI	$52,981,093	VI	$52,981,093	4	4	4
525	112.8	112.8	112.8	FBT72	$49,901,653	FBT72	$49,901,653	FBT72	$49,901,653	4	4	4
540	109.7	109.7	109.7	FBT72	$49,901,653	FBT72	$49,901,653	FBT72	$49,901,653	4	4	4
555	106.7	106.7	106.7	V	$48,717,253	V	$48,717,253	V	$48,717,253	4	4	4
570	103.9	103.9	103.9	V	$48,717,253	V	$48,717,253	V	$48,717,253	4	4	4
585	101.2	101.2	101.2	V	$48,717,253	V	$48,717,253	V	$48,717,253	4	4	4

Deck Reinforcement 205 Lbs/CY of Concrete

Cost of Deck/Feet $455

PBSJ	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	FOUNDATION LOADS AND NUMBER OF 18 IN. PRESTRESSED PILES	Design: SY Date: 11/29/00 Checked: CL Date: 11/29/00

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-5\[Type II Bridge 1.xls]RESULT

Alternative 5

Bridge Width (ft)	43.083													
Number of lanes	3													
Beam Type	VI	VI	VI	VI	VI	VI	VI	VI	VI	FB172	FBT72	V	V	V
Beam Weight (k/ft)	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	0.800	0.800	1.055	1.055	1.055
Number of Spans	390	405	420	435	450	465	480	495	510	525	540	555	570	585
Number of Beams	8	8	6	6	5	5	4	4	4	4	4	4	4	4
Span Length (ft)	151.8	146.2	141.0	136.1	131.6	127.4	123.4	119.6	116.1	112.8	109.7	106.7	103.9	101.2
Beam Span (ft)	149.8	144.2	139.0	134.1	129.6	125.4	121.4	117.6	114.1	110.8	107.7	104.7	101.9	99.2
Bridge Deck Thickness (in)	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Comp. Loads (ksf)	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Barrier Loads (k/ft)(both sides)	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Dead Load														
Beam Load (kips) (END BENT)	1158.1	1115.2	916.0	884.5	780.6	755.4	662.1	642.1	623.2	530.9	516.2	556.6	542.0	528.1
Beam Load (kips) (PIER)	2316.2	2230.4	1832.1	1768.9	1561.2	1510.9	1324.3	1284.1	1246.4	1061.9	1032.4	1113.3	1084.0	1056.2
Live Load														
Reduction factor	0.9													
Impact factor for Substructure	1.0													
LL Reaction per lane (END BENT)														
Truck load (kips)	67.57	67.40	67.23	67.06	66.89	66.72	66.55	66.38	66.21	66.04	65.87	65.70	65.53	65.36
Lane load (kips)	74.59	72.79	71.12	69.56	68.11	66.75	65.48	64.28	63.16	62.10	61.09	60.14	59.25	58.39
Total Live Load (kips) (END BENT)	201.4	196.5	192.0	187.8	183.9	180.2	179.7	179.2	178.8	178.3	177.9	177.4	176.9	176.5
LL Reaction per lane (PIER)														
Truck load (kips)	68.31	68.17	68.03	67.89	67.74	67.60	67.46	67.32	67.18	67.04	66.89	66.75	66.61	66.47
Lane load (kips)	123.18	119.58	116.24	113.13	110.22	107.51	104.96	102.57	100.32	98.19	96.19	94.29	92.49	90.79
Total Live Load (kips) (PIER)	332.6	322.9	313.8	305.4	297.6	290.3	283.4	276.9	270.9	265.1	259.7	254.6	249.7	245.1
Total Load														
Superstructure Load (kips) (END BENT)	1453.2	1405.4	1201.8	1166.0	1058.2	1029.4	935.5	915.0	895.7	802.9	787.7	827.7	812.6	798.3
Superstructure Load (kips) (PIER)	2706.9	2611.4	2204.1	2132.5	1917.0	1859.3	1665.8	1619.2	1575.4	1385.1	1350.2	1426.0	1391.9	1359.5
Foundation														
Maximum pile spacing (ft)	13.0													
Service Load Capacity of Piles (kips)	147.0													
** Number of Piles Reqd For END BENT	N/A	N/A	N/A	8.0	8.0	8.0	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0
** Number of Piles Reqd For PIER	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Service Design Load (kips)(END BENT)	N/A	N/A	N/A	146	132	129	134	131	128	134	131	138	135	133
Service Design Load (kips)(PIER)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

** NOTE: N/A indicates that required number of piles exceeds the max. number of piles based on minimum pile spacing (3 * pile size).

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Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

FOUNDATION LOADS AND NUMBER OF 24 IN. PRESTRESSED PILES

Sheet ____ of ____
Design. SY Date: 11/29/00
Checked. CL Date: 11/29/00

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Alternative 5

Bridge Width (ft)	43.083													
Number of lanes	3													
Beam Type	VI	VI	VI	VI	VI	VI	VI	VI	VI	FBT72	FBT72	V	V	V
Beam Weight (k/ft)	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	0.800	0.800	1.055	1.055	1.055
Number of Spans	390	405	420	435	450	465	480	495	510	525	540	555	570	585
Number of Beams	8	8	6	6	5	5	4	4	4	4	4	4	4	4
Span Length (ft)	151.8	146.2	141.0	136.1	131.6	127.4	123.4	119.6	116.1	112.8	109.7	106.7	103.9	101.2
Beam Span (ft)	149.8	144.2	139.0	134.1	129.6	125.4	121.4	117.6	114.1	110.8	107.7	104.7	101.9	99.2
Bridge Deck Thickness (in)	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Comp. Loads (ksf)	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Barrier Loads (k/ft)(both sides)	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Dead Load														
Beam Load (kips) (END BENT)	1158.1	1115.2	916.0	884.5	780.6	755.4	662.1	642.1	623.2	530.9	516.2	556.6	542.0	528.1
Beam Load (kips) (PIER)	2316.2	2230.4	1832.1	1768.9	1561.2	1510.9	1324.3	1284.1	1246.4	1061.9	1032.4	1113.3	1084.0	1056.2
Live Load														
Reduction factor	0.9													
Impact factor for Substructure	1.0													
LL Reaction per lane (END BENT)														
Truck load (kips)	67.57	67.40	67.23	67.06	66.89	66.72	66.55	66.38	66.21	66.04	65.87	65.70	65.53	65.36
Lane load (kips)	74.59	72.79	71.12	69.56	68.11	66.75	65.48	64.28	63.16	62.10	61.09	60.14	59.25	58.39
Total Live Load (kips) (END BENT)	201.4	196.5	192.0	187.8	183.9	180.2	179.7	179.2	178.8	178.3	177.9	177.4	176.9	176.5
LL Reaction per lane (PIER)														
Truck load (kips)	68.31	68.17	68.03	67.89	67.74	67.60	67.46	67.32	67.18	67.04	66.89	66.75	66.61	66.47
Lane load (kips)	123.18	119.58	116.24	113.13	110.22	107.51	104.96	102.57	100.32	98.19	96.19	94.29	92.49	90.79
Total Live Load (kips) (PIER)	332.6	322.9	313.8	305.4	297.6	290.3	283.4	276.9	270.9	265.1	259.7	254.6	249.7	245.1
Total Load														
Superstructure Load (kips) (END BENT)	1453.2	1405.4	1201.8	1166.0	1058.2	1029.4	935.5	915.0	895.7	802.9	787.7	827.7	812.6	798.3
Superstructure Load (kips) (PIER)	2706.9	2611.4	2204.1	2132.5	1917.0	1859.3	1665.8	1619.2	1575.4	1385.1	1350.2	1426.0	1391.9	1359.5
Foundation														
Maximum pile spacing (ft)	13.0													
Service Load Capacity of Piles (kips)	260.0													
** Number of Piles Reqd For END BENT	6.0	6.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
** Number of Piles Reqd For PIER	N/A	N/A	N/A	N/A	N/A	N/A	7.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0
Service Design Load (kips)(END BENT)	242	234	240	233	212	257	234	229	224	201	197	207	203	200
Service Design Load (kips)(PIER)	N/A	N/A	N/A	N/A	N/A	N/A	238	231	225	231	225	238	232	227

** NOTE: N/A indicates that required number of piles exceeds the max. number of piles based on minimum pile spacing (3 * pile size).

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Tamiami Trail Modified Water Deliveries to Everglades National Park Project
Preparation of Engineering Appendix For GRR/SEIS
Corps of Engineers, Jacksonville, Florida

FOUNDATION LOADS ON DRILLED SHAFT

Sheet ____ of ____
Design: SY Date: 11/29/00
Checked: CL Date: 11/29/00

I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative-5\[Type II Bridge 1.xls]RESULT

Alternative 5

Bridge Width (ft)	43.083													
Number of lanes	3													
Beam Type	VI	VI	VI	VI	VI	VI	VI	VI	VI	FB172	FB172	V	V	V
Beam Weight (k/ft)	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	0.800	0.800	1.055	1.055	1.055
Number of Spans	390	405	420	435	450	465	480	495	510	525	540	555	570	585
Number of Beams	8	8	6	6	5	5	4	4	4	4	4	4	4	4
Span Length (ft)	151.8	146.2	141.0	136.1	131.6	127.4	123.4	119.6	116.1	112.8	109.7	106.7	103.9	101.2
Beam Span (ft)	149.8	144.2	139.0	134.1	129.6	125.4	121.4	117.6	114.1	110.8	107.7	104.7	101.9	99.2
Bridge Deck Thickness (in)	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500	8.500
Comp. Loads (ksf)	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Barrier Loads (k/ft)(both sides)	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Dead Load														
Beam Load (kips) (END BENT)	1158.1	1115.2	916.0	884.5	780.6	755.4	662.1	642.1	623.2	530.9	516.2	556.6	542.0	528.1
Beam Load (kips) (PIER)	2316.2	2230.4	1832.1	1768.9	1561.2	1510.9	1324.3	1284.1	1246.4	1061.9	1032.4	1113.3	1084.0	1056.2
Live Load														
Reduction factor	0.9													
Impact factor for Substructure	1.0													
LL Reaction per lane (END BENT)														
Truck load (kips)	67.57	67.40	67.23	67.06	66.89	66.72	66.55	66.38	66.21	66.04	65.87	65.70	65.53	65.36
Lane load (kips)	74.59	72.79	71.12	69.56	68.11	66.75	65.48	64.28	63.16	62.10	61.09	60.14	59.25	58.39
Total Live Load (kips) (END BENT)	201.4	196.5	192.0	187.8	183.9	180.2	179.7	179.2	178.8	178.3	177.9	177.4	176.9	176.5
LL Reaction per lane (PIER)														
Truck load (kips)	68.31	68.17	68.03	67.89	67.74	67.60	67.46	67.32	67.18	67.04	66.89	66.75	66.61	66.47
Lane load (kips)	123.18	119.58	116.24	113.13	110.22	107.51	104.96	102.57	100.32	98.19	96.19	94.29	92.49	90.79
Total Live Load (kips) (PIER)	332.6	322.9	313.8	305.4	297.6	290.3	283.4	276.9	270.9	265.1	259.7	254.6	249.7	245.1
Total Load														
* Superstructure Load (kips) (END BENT)	1482.3	1434.5	1230.9	1195.1	1087.3	1058.5	964.6	944.1	924.7	832.0	816.8	856.8	841.7	827.4
* Superstructure Load (kips) (PIER)	2726.3	2630.8	2223.5	2151.9	1936.4	1878.7	1685.2	1638.6	1594.8	1404.5	1369.6	1445.4	1411.3	1378.9
Foundation														
Maximum pile spacing (ft)	16.0													
Cantilever dist. from shaft to coping (ft)	6.0													
Number of Piles Required For END BENT	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Number of Piles Required For PIER	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Service Design Load (kips)(END BENT)	494	478	410	398	362	353	322	315	308	277	272	286	281	276
Service Design Load (kips)(PIER)	1363	1315	1112	1076	968	939	843	819	797	702	685	723	706	689

INTERMEDIATE BENTS / PIERS

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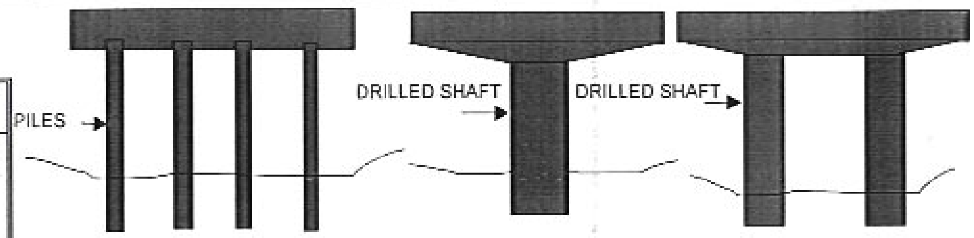
Alternative 5

	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
Pile Dia.(Inches)			
Estimated Pile Embedment Length(Ft.)	19	19	21
Pile Length Above Ground(Ft.)	8	8	8
Total Length of Pile (Ft.)	27	27	29
Estimated Cost of One Pile/Drilled Shaft	$891	$1,242	$6,380
BentCap X-section (SqFt.)	9	9	12
Bent Length(Ft.)	43.083	43.083	43.083
Total Concrete Volume(CY.)	14.36	14.36	19.15
Reinforcement(Lbs) *	2082	2082	2776
ESTIMATED COST OF BENT CAP	$6,897	$6,897	$9,196



INTERMEDIATE BENT SECTION

PIER SECTION W/ SINGLE DRILLED SHAFT

PIER SECTION / DOUBLE DRILLED SHAFT

* 145 Lbs/CY

PRESTRESSED PILES	18 IN. PILES	24 IN. PILES
No. of test piles with dynamic load tests per bridge	297	297
Estimated total cost of test piles w/ dynamic load test per bridge	$1,995,840.00	$1,995,840.00
% of pile splice	10	10
% of pile hole preformed	100	100

DRILLED SHAFT		
No.of test load for drilled shaft per bridge	EA	1
Core(Shaft Excavation)	LF	0
Length of temporary casing	LF	0
% of casing splice	%	0
Excavation, unclassified shaft	LF	
Drilled shaft sidewall overreaming	LF	0
Excavation, unclassified extra depth	LF	0

NUMBER OF SPANS	NUMBER OF PILES		NUMBER OF DRILLED SHAFT	TOTAL COST OF PILES PER BENT		TOTAL COST OF DRILLED SHAFT PER PIER	ESTIMATED COST OF ONE BENT/PIER		
	18 IN. PILES	24 IN. PILES		18 IN. PILES	24 IN. PILES		18 IN. PILES	24 IN. PILES	DRILLED SHAFT
390	N/A	N/A	2	N/A	N/A	$12,889	N/A	N/A	$22,084
405	N/A	N/A	2	N/A	N/A	$12,884	N/A	N/A	$22,080
420	N/A	N/A	2	N/A	N/A	$12,879	N/A	N/A	$22,075
435	N/A	N/A	2	N/A	N/A	$12,875	N/A	N/A	$22,071
450	N/A	N/A	2	N/A	N/A	$12,871	N/A	N/A	$22,067
465	N/A	N/A	2	N/A	N/A	$12,868	N/A	N/A	$22,064
480	N/A	7	2	N/A	$14,380	$12,864	N/A	$21,277	$22,060
495	N/A	7	2	N/A	$14,253	$12,861	N/A	$21,150	$22,057
510	N/A	7	2	N/A	$14,134	$12,858	N/A	$21,031	$22,054
525	N/A	6	2	N/A	$12,563	$12,855	N/A	$19,460	$22,051
540	N/A	6	2	N/A	$12,457	$12,853	N/A	$19,354	$22,049
555	N/A	6	2	N/A	$12,357	$12,850	N/A	$19,253	$22,046
570	N/A	6	2	N/A	$12,262	$12,848	N/A	$19,158	$22,044
585	N/A	6	2	N/A	$12,172	$12,846	N/A	$19,068	$22,041

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of 2
	END BENTS	Design: FO Date: 11/29/00 Checked: CL Date: 11/29/00

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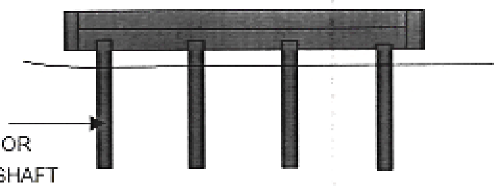
Alternative 5

Pile Dia.(Inches)	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
Estimated Pile Embedment Length(Ft.)	19	19	21
Pile Length Above Ground(Ft.)	8	8	8
Total Length of Pile (Ft.)	27	27	29
Estimated Cost of One Pile/Drilled Shaft	$891	$1,242	$6,380
End BentCap X-section (SqFt.)	7.5	7.5	12
End Bent Length(Ft.)	43.083	43.083	43.083
Total Concrete Volume(CY.)	11.97	11.97	19.15
Reinforcement(Lbs) *	1735	1735	2776
ESTIMATED COST OF BENT CAP	$5,747	$5,747	$9,196



* 145 Lbs/CY

	PRESTRESSED PILES	
	18 IN. PILES	24 IN. PILES
% of pile splice	10	10
% Pile hole preformed	100	100

DRILLED SHAFTS		
Core(Shaft Excavation)	LF	0
Length of temporary casing	LF	0
%'age of casing splice	%	0
Excavation, unclassified shaft	LF	
Drilled shaft sidewall overreaming	LF	0
Excavation, unclassified extra depth	LF	

NUMBER OF SPANS	* NUMBER OF PILES		** NUMBER OF	TOTAL COST OF PILES PER ENDBENT		TOTAL COST OF DRILLED SHAFT PER	ESTIMATED COST OF ONE ENDBENT		
	18 IN. PILES	24 IN. PILES	DRILLED SHAFT	18 IN. PILES	24 IN. PILES	ENDBENT **	18 IN. PILES	24 IN. PILES	DRILLED SHAFT
390	N/A	6	5	N/A	$8,754	$31,900	N/A	$31,327	$57,921
405	N/A	6	5	N/A	$8,754	$31,900	N/A	$31,327	$57,921
420	N/A	5	5	N/A	$7,295	$31,900	N/A	$29,868	$57,921
435	10	5	5	$11,020	$7,295	$31,900	$33,593	$29,868	$57,921
450	10	5	5	$11,020	$7,295	$31,900	$33,593	$29,868	$57,921
465	10	4	5	$11,020	$5,836	$31,900	$33,593	$28,409	$57,921
480	9	4	5	$9,918	$5,836	$31,900	$32,491	$28,409	$57,921
495	9	4	5	$9,918	$5,836	$31,900	$32,491	$28,409	$57,921
510	9	4	5	$9,918	$5,836	$31,900	$32,491	$28,409	$57,921
525	8	4	5	$8,816	$5,836	$31,900	$31,389	$28,409	$57,921
540	8	4	5	$8,816	$5,836	$31,900	$31,389	$28,409	$57,921
555	8	4	5	$8,816	$5,836	$31,900	$28,791	$25,811	$55,324
570	8	4	5	$8,816	$5,836	$31,900	$28,791	$25,811	$55,324
585	8	4	5	$8,816	$5,836	$31,900	$28,791	$25,811	$55,324

* Includes 2 wingwall piles for all beam types

** Includes 2 wingwall drilled shafts for all beam types

PBS&J	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida	Sheet ____ of ____
	SUBSTRUCTURE & SUPERSTRUCTURE ALTERNATIVES COMPARISION	Design FO Date 11/29/00 Checked CL Date 11/29/00

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Alternative 5

SPAN NUMBER	ADJUSTED SPAN LENGTH (FT.) 18 IN. PILES	24 IN. PILES	DRILLED SHAFT	NO. OF PIERS	COST OF SUBSTRUCTURE 18 IN. PILES	24 IN. PILES	DRILLED SHAFT	COST OF SUPER STRUCTURE 18 IN. PILES	24 IN. PILES	DRILLED SHAFT	TOTAL COST OF STRUCTURE 18 IN. PILES	24 IN. PILES	DRILLED SHAFT
390	151.8	151.8	151.8	389	N/A	N/A	$8,706,660	$79,037,893	$79,037,893	$79,037,893	N/A	N/A	$87,744,553
405	146.2	146.2	146.2	404	N/A	N/A	$9,035,997	$79,037,893	$79,037,893	$79,037,893	N/A	N/A	$88,073,890
420	141.0	141.0	141.0	419	N/A	N/A	$9,365,334	$66,009,493	$66,009,493	$66,009,493	N/A	N/A	$75,374,827
435	136.1	136.1	136.1	434	N/A	N/A	$9,694,672	$66,009,493	$66,009,493	$66,009,493	N/A	N/A	$75,704,165
450	131.6	131.6	131.6	449	N/A	N/A	$10,024,009	$59,495,293	$59,495,293	$59,495,293	N/A	N/A	$69,519,302
465	127.4	127.4	127.4	464	N/A	N/A	$10,353,347	$59,495,293	$59,495,293	$59,495,293	N/A	N/A	$69,848,640
480	123.4	123.4	123.4	479	N/A	$10,248,286	$10,682,684	$52,981,093	$52,981,093	$52,981,093	N/A	$63,229,379	$63,663,777
495	119.6	119.6	119.6	494	N/A	$10,504,934	$11,012,022	$52,981,093	$52,981,093	$52,981,093	N/A	$63,486,027	$63,993,115
510	116.1	116.1	116.1	509	N/A	$10,761,582	$11,341,359	$52,981,093	$52,981,093	$52,981,093	N/A	$63,742,675	$64,322,452
525	112.8	112.8	112.8	524	N/A	$10,253,714	$11,670,696	$49,901,653	$49,901,653	$49,901,653	N/A	$60,155,367	$61,572,349
540	109.7	109.7	109.7	539	N/A	$10,488,477	$12,000,034	$49,901,653	$49,901,653	$49,901,653	N/A	$60,390,130	$61,901,687
555	106.7	106.7	106.7	554	N/A	$10,718,044	$12,324,175	$48,717,253	$48,717,253	$48,717,253	N/A	$59,435,297	$61,041,428
570	103.9	103.9	103.9	569	N/A	$10,952,807	$12,653,513	$48,717,253	$48,717,253	$48,717,253	N/A	$59,670,060	$61,370,766
585	101.2	101.2	101.2	584	N/A	$11,187,571	$12,982,850	$48,717,253	$48,717,253	$48,717,253	N/A	$59,904,824	$61,700,103

SUMMARY OF MOST ECONOMICAL ALTERNATIVES FOR EACH SPAN ARRANGEMENT:

COST	FOUNDATION ALTERNATIVE	SUPERSTR. ALTERNATIVE	CORRESPONDING NUMBER OF SPANS	NUMBER OF BEAMS	NUMBER OF PILES OR DRILLED SHAFT	TOTAL LENGTH OF PILES OR DRILLED SHAFT (FT.)	NUMBER OF TEST PILES	TOTAL LENGTH OF TEST PILES (FT.)
$87,744,553	DRILLED SHAFT	VI	390	8	788	22852	0	0
$88,073,890	DRILLED SHAFT	VI	405	8	818	23722	0	0
$75,374,827	DRILLED SHAFT	VI	420	6	848	24592	0	0
$75,704,165	DRILLED SHAFT	VI	435	6	878	25462	0	0
$69,519,302	DRILLED SHAFT	VI	450	5	908	26332	0	0
$69,848,640	DRILLED SHAFT	VI	465	5	938	27202	0	0
$63,663,777	DRILLED SHAFT	VI	480	4	968	28072	0	0
$63,993,115	DRILLED SHAFT	VI	495	4	998	28942	0	0
$64,322,452	DRILLED SHAFT	VI	510	4	1028	29812	0	0
$61,572,349	DRILLED SHAFT	FBT72	525	4	1058	30682	0	0
$61,901,687	DRILLED SHAFT	FBT72	540	4	1088	31552	0	0
$61,041,428	DRILLED SHAFT	V	555	4	1118	32422	0	0
$61,370,766	DRILLED SHAFT	V	570	4	1148	33292	0	0
$61,700,103	DRILLED SHAFT	V	585	4	1178	34162	0	0

$61,041,428 <--- Minimum

RESULT OF COST COMPARISON STUDY:

MOST ECONOMICAL SUPERSTRUCTURE TYPE:	V		
MOST ECONOMICAL SUBSTRUCTURE TYPE:	DRILLED SHAFT		
OPTIMUM SPAN ARRANGEMENT	555	SPANS AT	106.70 FT.
TOTAL BRIDGE LENGTH:	59220 FT.		
TOTAL NUMBER OF BEAMS:	2220		
TOTAL BEAM LENGTH:	236880 FT.		
NUMBER OF PILES OR DRILLED SHAFT	1118		
LENGTH OF PILES OR DRILLED SHAFT:	32422 FT.		

NOTE: DRILLED SHAFT ALTERNATIVE IS CHOSEN TO MINIMIZE THE OBSTRUCTION IN CANAL

PBSJ	Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS	Sheet ____ of ____	
	Corps of Engineers, Jacksonville, Florida	Design: FO	Date: 11/29/00
	ESTIMATE OF PROBABLE CONSTRUCTION COSTS	Checked: CL	Date: 11/29/00

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Alternative 5

ITEM	QUANTITY	UNITS	UNIT PRICE	AMOUNT
SUPERSTRUCTURE:				
Class II Concrete -- (Superstructure)	66934.2	CY	$310.00	$20,749,611
Reinforcing Steel -- (Superstructure)*	13721517	LBS	$0.45	$6,174,682
Bridge Floor Grooving	263200	SY	$2.50	$658,000
Traffic Railing Barrier	118440.0	FT	$35.00	$4,145,400
Expansion Joints***	8616.6	FT	$84.00	$723,794
AASHTO Beam, Type V	236880.0	FT	$92.00	$21,792,960
Neoprene Bearing Pads	1243.200	CY	$425.00	$528,360
		Superstructure Subtotal		$54,772,807
SUBSTRUCTURE:				
Class II Concrete -- (Substructure)	10705.3	CY	$415.00	$4,442,684
Reinforcing Steel -- (Substructure)**	1552263	LBS	$0.45	$698,518
Pile Hole, Preformed	0	EA	$0.00	$0
Test Piles	0	Ft.	$0.00	$0
Prestressed Concrete Piles (F & I)	0	Ft.	$0.00	$0
Pile Splices	0	EA	$0.00	$0
Drilled shaft	32422	LF	$220.00	$7,132,840
Test load for drilled shaft	1	EA	$50,000.00	$50,000
Core(Shaft Excavation)	0	LF	$0.00	$0
Temporary casing	0	LF	$0.00	$0
Casing splice	0	EA	$0.00	$0
Excavation, unclassified shaft	0	LF	$0.00	$0
Drilled shaft sidewall overreaming	0	LF	$0.00	$0
Excavation, unclassified extra depth	0	LF	$0.00	$0
		Substructure Subtotal		$12,324,043
		Construction Cost Subtotal		**$67,096,850**
Mobilization (5% of Construction Cost)	1	LS		$3,354,843
Contingency (15% of Construction Cost)	1	LS		$10,064,527.51
		Total Construction Cost		**$80,516,220**
		Deck Square Footage (Ft.)		2,551,375
		Cost Per Square Foot		**$31.56**

*RATIO REBAR:CONC. (SUPERSTRUCTURE):	205	Lbs/CY.
**RATIO REBAR:CONC. (SUBSTRUCTURE):	145	Lbs/CY.
***NO.OF EXPANSION PIERS:	200	

Tamiami Trail Modified Water Deliveries to Everglades National Park Project Preparation of Engineering Appendix For GRR/SEIS Corps of Engineers, Jacksonville, Florida		PBSJ Done by: F. ORNARLI
Alternative 2D	**ESTIMATE OF ADDITIONAL COST OF STRUCTURES**	Checked by: S.YETIMOGLU
I:\STRUCT\Design\Tamiami-Trail\design\cost-analysis\alternative 2Dcanalside\[Walls.xls]CantWall		November 29, 2000

Project Length 59220.00 Ft

Total Bridge Length 3841.00 Ft (2 - 475ft long, 2 - 345.5ft long, 1 - 1000ft long and 1 - 1200ft long bridges)

NOTE: 1000ft long bridge is at Tiger Tail Camp area & 1200ft long bridge is at abondoned park area on the east side of Struct. S355B are proposed not to further reduce the width of narrower canal in these area.

ITEM	UNIT PRICE	QTY	TOTAL PRICE
1000ft long Bridge at Tiger Tail Camp	$32.00	43000 SF	$1,376,000.00
1200ft long Bridge at Park Area	$32.00	51600 SF	$1,651,200.00
Retaining wall on canal side(Kingpile System)	$461.43	55379 LF	$25,553,285.84
Retaining wall on canal side	$159.28	55379 LF	$8,820,686.79
Temporary retaining system	$331.68	55379 LF	$18,367,958.02
Traffic Barrier on retaining wall	$35.00	55379 LF	$1,938,265.00
		*** TOTAL:**	**$57,707,396**

*** NOTE: This cost is additional to the cost of 4 bridges in Alternative 2.**